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NATIONAL DAM SAFETY PROGRAM. MINK CREEK DAM (ID NUMBER VA-00352--ETC(U)
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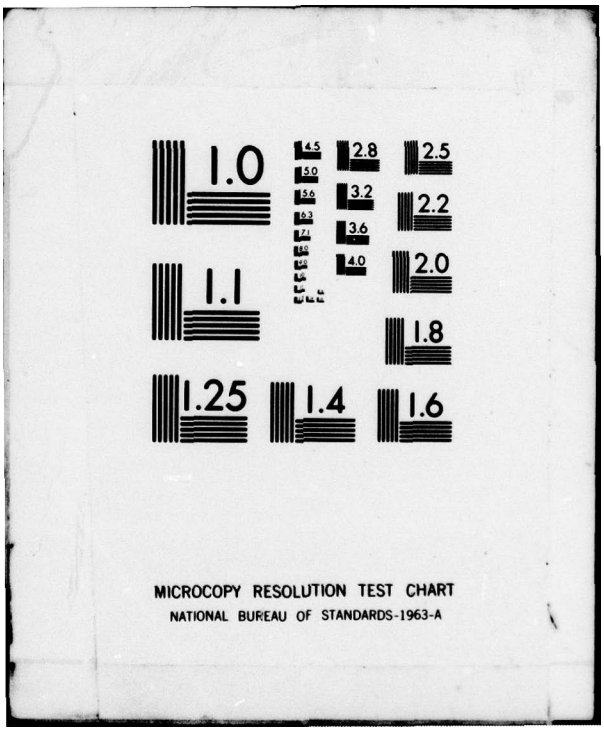
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NATIONAL BUREAU OF STANDARDS-1963-A

JAMES RIVER BASIN

LEVEL II

Name Of Dam: Mink Creek

Location: Albemarle County, State of Virginia

Inventory Number: VA 00352

(6) B.S

# PHASE I INSPECTION REPORT NATIONAL DAM SAFETY PROGRAM





U.S. ARMY CORPS OF ENGINEERS · NORFOLK DISTRICT



FEBRUARY 1979

PREPARED FOR

NORFOLK DISTRICT CORPS OF ENGINEERS
803 FRONT STREET
NORFOLK, VIRGINIA 23510



BY

MICHAEL BAKER, JR., INC.
BEAVER, PENNSYLVANIA 15009

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Albemarle Co., Virginia

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20. Abstract

Pursuant to Public Law 92-367, Phase I Inspection Reports are prepared under guidance contained in the recommended guidelines for safety inspection of dams, published by the Office of Chief of Engineers, Washington, D. C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general conditions of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

Based upon the field conditions at the time of the field inspection and all available engineering data, the Phase I report addresses the hydraulic, hydrologic, geologic, geotechnic, and structural aspects of the dam. The engineering techniques employed give a reasonably accurate assessment of the conditions of the dam. It should be realized that certain engineering aspects cannot be fully analyzed during a Phase I inspection. Assessment and remedial measures in the report include the requirements of additional indepth study when necessary.

Phase I reports include project information of the dam and appurtenances, all existing engineering data, operational procedures, hydraulic/hydrologic data of the watershed, dam stability, visual inspection report and an assessment including required remedial measures.

## PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of the Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the spillway design flood is based on the estimated "Probable Maximum Flood" for the region (flood discharges that may be expected from the most severe combination of critical meteorologic and hydrologic conditions that are reasonably possible), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the design flood should not be interpreted as necessarily posing a highly inadequate condition. The design flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam: Mink Creek
State: Virginia
County: Albemarle
Stream: Mink Creek
Date of Inspection: 17 November 1978

## BRIEF ASSESSMENT OF DAM

Mink Creek Dam, a homogeneous earthen dam approximately 370 feet long and 39 feet high, is owned and operated as a flood control structure by the Town of Scottsville, Virginia. The visual inspection and review of engineering data, made in November and December 1978, indicate no deficiencies requiring immediate attention.

The emergency spillway will pass 50 percent of the Problem Maximum Flood (PMF) without overtopping which is considered inadequate but not seriously inadequate for the "small" size-"high" hazard classification of Mink Creek Dam. Visual observations during the inspection indicated no evidence of embankment instability or piping, and stability analyses reviewed show a sufficient factor of safety for the downstream slope.

It is recommended that stability analyses be performed on the upstream slope assuming full drawdown conditions, or at a minimum, drawdown from normal pool. It is also recommended that the erosion gullies in the approach channel to the emergency spillway and the settled areas behind the side wall on both sides of the impact basin be filled and reseeded. An annual maintenance and inspection program should be initiated; at which time the previously mentioned maintenance items should be scheduled. A formal warning system should also be considered for the occupants of dwellings located downstream of the dam.

MICHAEL BAKER, JR., INC.

Michael Baker, III, P.E.
Chairman of the Board and
Chief Executive Officer

SUBMITTED: Original signed by JAMES A. WALSH
James A. Walsh
Chief, Design Branch

RECOMMENDED: Original signed by ZANE M. GOODWIN
Zane M. Goodwin
Chief, Engineering

APPROVED: Original signed by: Douglas L. Haller
Douglas L. Haller
Colonel, Corps of Engineers
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Date: FEB 23 1979

COMMONWEALTH OF VIRGINIA
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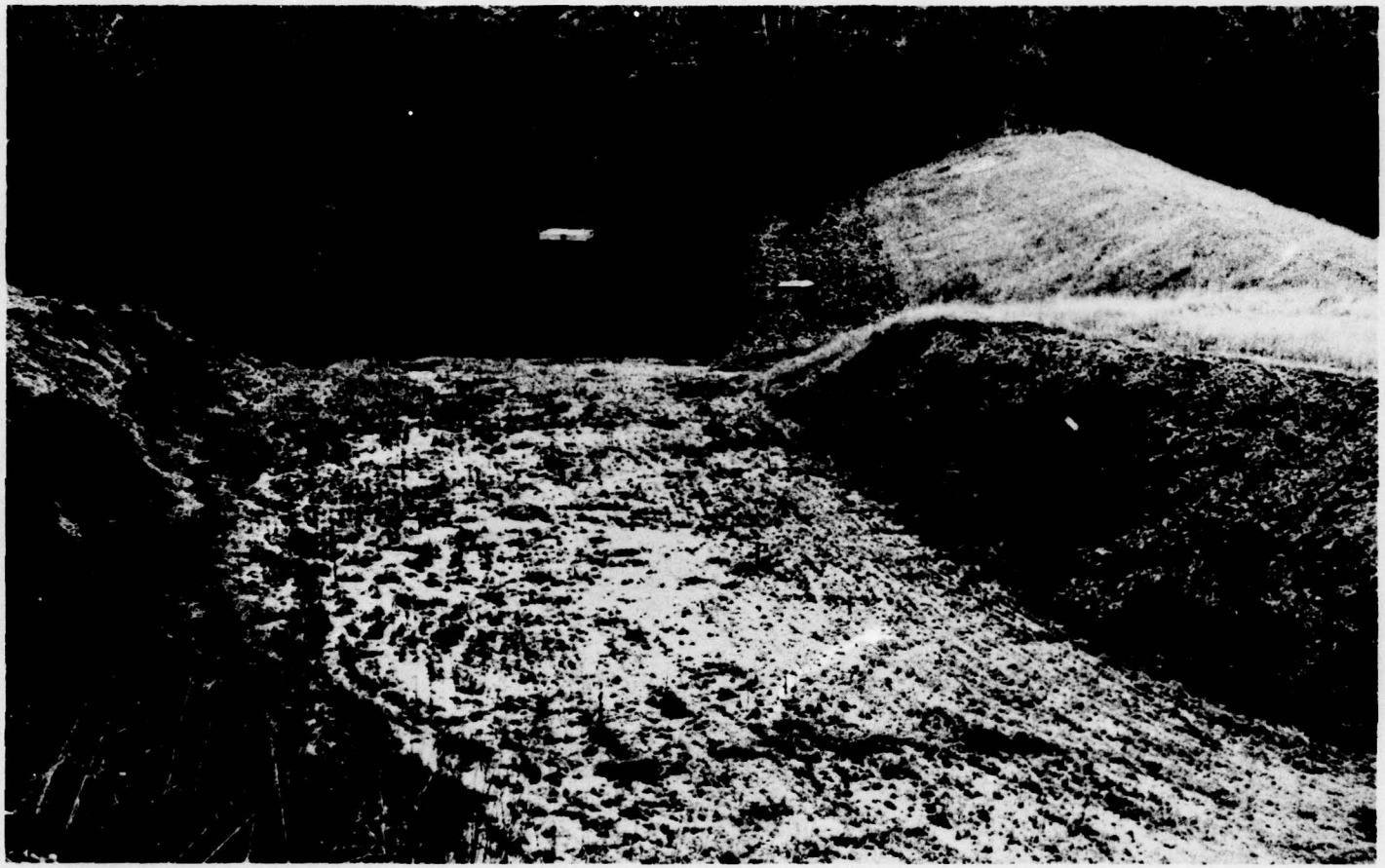


**OVERALL VIEW OF DAM**

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NAME OF DAM: MINK CREEK ID# VA 00352

SECTION 1 - PROJECT INFORMATION

## 1.1 General

1.1.1 Authority: Public Law 92-367, 8 August 1972, authorized the Secretary of the Army, through the Corps of Engineers to initiate a national program of safety inspections of dams throughout the United States. The Norfolk District has been assigned the responsibility of supervising the inspection of dams in the Commonwealth of Virginia.

1.1.2 Purpose of Inspection: The purpose is to conduct a Phase I inspection according to the Recommended Guidelines for Safety Inspection of Dams. The main responsibility is to expeditiously identify those dams which may be a potential hazard to human life or property.

## 1.2 Description of Project

1.2.1 Description of Dam and Appurtenances: Mink Creek Dam is used primarily for flood control; although, the dam was also designed for emergency water supply during fires for the Town of Scottsville, Virginia. The dam is a homogeneous earthfill structure about 370 feet long and 39 feet high. The top of dam is 15 feet wide and is at elevation 321.0 feet above Mean Sea Level (M.S.L.). Side slopes of the dam are 2.5 horizontal to 1 vertical (2.5:1) on the downstream side and 3:1 on the upstream side.

The principal spillway consists of a 42 inch diameter reinforced concrete pipe. This pipe is served by a 10 foot square drop-inlet structure (riser) with 3 by 7 foot openings on three sides maintaining normal pool at an elevation of 301.0 feet M.S.L. An impact basin consisting of a baffle wall and end sill is located at the end of the pipe so that discharges will not erode the toe of the dam.

The emergency spillway is a vegetated, earth, side-channel spillway located outside the right abutment of the dam. It has a bottom width of 50 feet and has a control section with an elevation of 313.0 feet M.S.L. Side slopes in the emergency spillway are cut on 1:1 slopes.

A 36 by 36 inch sluice gate is located on the upstream side of the riser with an invert elevation of 289.5 feet M.S.L. and can be used to drain the reservoir.

1.2.2 Location: Mink Creek Dam, located near the Town of Scottsville, Virginia, is situated on Mink Creek about 2000 feet above its confluence with the James River.

1.2.3 Size Classification: The dam, which has a maximum height of 39 feet, is classified as a "small" size structure as defined by the Recommended Guidelines for Safety Inspection of Dams.

1.2.4 Hazard Classification: Because of its close proximity to the Town of Scottsville, Virginia, and the dwellings immediately downstream; the dam is classified as "high" hazard in accordance with guidelines contained in Section 2.1.2 of the Recommended Guidelines for Safety Inspection of Dams. The hazard classification used to categorize dams is a function of location only and has nothing to do with its stability or probability of failure.

1.2.5 Ownership: Mink Creek Dam is owned by the Town of Scottsville, Virginia.

1.2.6 Purpose of Dam: The dam is used for flood control and as an emergency water supply for fires by Scottsville, Virginia.

1.2.7 Design and Construction History: Initial design of Mink Creek Dam was done by Richard L. Williams, Consulting Engineer, Roanoke, Virginia. Final design was done by John McNair and Associates, Waynesboro, Virginia for the Town of Scottsville. The dam, completed in November of 1977, was constructed by Moore Golf, Inc., Culpeper, Virginia.

1.2.8 Normal Operating Procedures: According to the report on dam operation (see Appendix VI), under normal operating conditions; the main slide gate on the inlet of the 42 inch diameter outlet pipe is completely open and water flows into the riser over the weir openings at elevation 301.0 feet M.S.L. When the stream channel downstream of the dam becomes full of water from backwater from the James River, the main slide gate is closed allowing no additional discharge from the dam. If the James River channel is not full, then the main gate is left open and the dam will automatically hold back excessive flows from the Mink Creek watershed.

## 1.3 Pertinent Data

1.3.1 Drainage Area: The dam controls a drainage area of 0.92 square miles.

1.3.2 Discharge at Dam Site: No major flooding has occurred during the brief life of the dam since November 1977.

Principal Spillway:
- Pool level at emergency spillway crest . . . . . 263 c.f.s.
- Pool level at top of dam . . . . 297 c.f.s.

Emergency Spillway:
- Pool level at top of dam . . . . 3200 c.f.s.

1.3.3 Dam and Reservoir Data: Pertinent data on the dam and reservoir are shown in the following table:

TABLE 1.1 DAM AND RESERVOIR DATA

| Item | Elevation feet M.S.L. | Reservoir Capacity: Area acres | Reservoir Capacity: Acre-feet | Reservoir Capacity: Watershed inches | Length feet |
|---|---|---|---|---|---|
| Top of dam | 321.0 | 17.4 | 226 | 4.61 | 2400 |
| Emergency spillway crest | 313.0 | 11.0 | 88 | 1.79 | 1400 |
| Principal spillway crest | 301.0 | 5.5 | 30 | 0.61 | 1000 |
| Streambed at centerline of dam | 282.0 | - | - | - | - |

## SECTION 2 - ENGINEERING DATA

2.1 Design: The design data reviewed included the following:

1) Copies of the Design Plans for Mink Creek Dam by John McNair and Associates. These design plans included typical sections of the dam, soil borings locations, borrow areas locations, outlet structure plans, impact basin details, and emergency spillway sections. Plan and typical sections of the dam are included as Plates 1, 2 and 3 (Appendix I).

2) Specifications for the Mink Creek Dam by John McNair and Associates.

3) "Supplemental Engineering Study, Mink Creek Dam Emergency Spillway, Scottsville, Virginia" by John McNair and Associates, April 1977 (Appendix V). The study discusses the adequacy of the Mink Creek Dam emergency spillway. It states that the emergency spillway can safely pass a peak flow from a storm with a precipitation of 12 inches in a 6 hour period under saturated ground conditions. It further states that larger storms with greater precipitation would result in overtopping and possible failure with a great deal of damage downstream in the Town of Scottsville.

4) Report on "Mink Creek Dam Operation" by Edward A. Mahoney, December 1977 (Appendix VI). The report discusses suggested operation of the dam including a description of the facility, problem of flooding, storm on Mink Creek watershed, "superstorm" and dam safety, gate operation, and fire line operation.

5) Soil and Geological Studies, Mink Creek Dam (Appendix VII). Included is a report by E. O. Gooch and Associates on seven soil test borings, laboratory soil tests, geological and soil studies and discussions on the geology, cutoff trench, spillway, and embankments. The study recommended that slopes of 3:1 and 2.5:1, upstream and downstream respectively, be used and that a grout curtain would not be needed under the dam. The report also stated that a concrete-lined spillway section over much of the spillway might not be necessary and that the floodplain soil from under the embankment need not be removed.

Also included are boring logs and pressure tests results extracted from "Mink Creek Dam and Reservoir Report and Preliminary Engineering," dated 8 April 1976 by Balzer and Associates; Geotechnics, Inc.; and Richard L. Williams, P.E.

All existing data, with the exception of the Specifications which were returned to the Town of Scottsville, have been filed with the Norfolk District for future reference.

2.2 Construction: The dam was constructed by Moore Golf, Inc., Culpeper, Virginia in 1977. The dam was officially dedicated in November 1977.

2.3 Operation: The dam is operated and maintained by the Town of Scottsville. Operation is automatic except for periods when the James River causes backwater flooding in the Town of Scottsville. According to the report (see Appendix VI), the main gate is closed at this time which restricts outflows from the dam and helps to reduce flooding. Although not presently operational, the dam is also designed to provide water for fire supply for the Town of Scottsville. According to design (see Appendix VI), the main 42 inch gate would be closed creating a pressure head on the 12 inch waterline which is taken off the outlet conduit just upstream of the gate.

2.4 Evaluation

2.4.1 Design: The design drawings were generally adequate for review. However, no design calculations were available.

2.4.2 Construction: No construction reports or as-built drawings were available to evaluate construction methods or alterations. However, external structures were in accordance with design relative to size, type and location.

2.4.3 Operation: Operation of the dam and reservoir, which involves closing the 42 inch main gate when the James River has backed up into Mink Creek, should be reevaluated. This procedure prematurely uses up storage while producing little or no benefit. By closing the gate and prematurely using the flood storage, flood flows from the emergency spillway may actually be greater than if the gate had been

left open. If closing the gate causes the emergency spillway capacity to be exceeded and the dam to be overtopped, a resulting failure could be catastrophic. For this reason the gate should not be closed in an effort to obtain additional flood control.

## SECTION 3 - VISUAL INSPECTION

### 3.1 Findings

3.1.1 General: The dam and its appurtenant structures were found to be in good overall condition at the time of the inspection on 17 November 1978. The problems noted do not require immediate remedial treatment, but they should be corrected as part of a regular maintenance program. Noteworthy deficiencies observed are described briefly in the following paragraphs. The complete visual inspection check list is given in Appendix III.

3.1.2 Dam: The embankment was in good condition. Patches of grass are growing in portions of the upstream riprap and the downstream rock gutters. Driftwood is scattered on the upstream shoreline.

3.1.3 Appurtenant Structures: The concrete structures including the riser (see Photo 2) and impact basin (see Photos 3 and 4) are intact without damage. The only deficiency observed was some minor settlement and erosion of the earth backfill near the ends of the concrete walls for the impact basin.

3.1.4 Emergency Spillway: The spillway can function for overflow conditions as designed, but there are some deficiencies which include erosion gullies (see Photo 5) in the approach channel at the shoreline, minor clear seepage in the discharge channel and moderate erosion with rock breakage in the cut slopes. The discharge channel of the emergency spillway is shown in Photo 6.

3.1.5 Reservoir Area: The reservoir area did not have any significant shoreline erosion.

3.1.6 Downstream Channel: The downstream channel (see Photo 4) is unobstructed and well formed with stone riprap adjacent to the impact basin, bedrock bottom and soil slopes further downstream.

## 3.2 Evaluation

3.2.1 Dam: The embankment is in good physical condition. The driftwood should be removed because of the possibility of the primary spillway clogging. The flow from the toe drain should be monitored during periods of high reservoir levels to detect any significant increase in flow.

3.2.2 Emergency Spillway: The erosion gullies in the approach channel should be repaired and protection against erosion from surface runoff should be provided. Surface runoff should be diverted by drainage ditches for erosion protection in both the approach and exit channels. The erosion and sloughage in the cut slopes do not appear to be serious at this time.

3.2.4 Appurtenant Structures: The settlement and erosion of the backfill adjacent to the walls of the impact basin should be repaired with compacted soil and the area should be reseeded. Surface runoff should also be diverted.

3.2.5 Reservoir Area: The reservoir area is in good condition. A staff gage should be installed to monitor reservoir levels above normal pool.

3.2.6 Downstream Channel: The downstream channel is in good condition.

## SECTION 4 - OPERATIONAL PROCEDURES

4.1 Procedures: Operational procedures are generally discussed in paragraphs 1.2.8, 2.3 and 2.4, and Appendix VI. The normal reservoir elevation is maintained by the riser crest.

The reservoir can be drained by use of the 36 inch slide gate on the upstream face of the riser.

4.2 Maintenance of Dam: The Town of Scottsville, the owner, is responsible for maintenance of the dam.

4.3 Maintenance of Operating Facilities: The Town of Scottsville is also responsible for the maintenance of the operating gates. The hand crank for the gates is kept at the Town office within 0.5 mile of the dam.

4.4 Warning System: The report presented in Appendix VI calls for constant monitoring of the dam during major floods. It is recommended that a formal emergency procedure be prepared and prominently displayed, and furnished to all operating personnel. This should include:

1) How to operate the dam during an emergency (portion included in Appendix VI).

2) Who to notify, including public officials, in case evacuation from the downstream area is necessary.

3) Procedures for evaluating inflow during periods of emergency operation (portion included in Appendix VI).

The occupied dwellings situated immediately downstream of the dam indicate the importance of an effective warning system.

4.5 Evaluation: The maintenance and operation of the dam appear to be sufficient. Records of high flows and gate operation should be kept, if possible, for future use. A staff gage should be installed for this purpose.

Operation of the dam and reservoir, which involves closing the 42 inch main gate when the James River has backed up into Mink Creek, should be reevaluated. This procedure prematurely uses up storage while producing little or no benefit. By closing the gate and prematurely

using the flood storage, flood flows from the emergency spillway may actually be greater than if the gate had been left open. If closing the gate causes the emergency spillway capacity to be exceeded and the dam to be overtopped, a resulting failure could be catastrophic. For this reason the gate should not be closed in an effort to obtain additional flood control.

## SECTION 5 - HYDRAULIC/HYDROLOGIC DATA

5.1 Design: A report by John McNair and Associates "Mink Creek Dam Emergency Spillway" (see Appendix V) and another report by Edward A. Mahoney, "Mink Creek Dam Operation" (see Appendix VI) were the only design hydrologic/hydraulic data available for review in preparing this report.

5.2 Hydrologic Records: No rainfall or stream flow records were available at the dam site.

5.3 Flood Experience: No major flooding has occurred on Mink Creek since the dam was completed in 1977.

5.4 Flood Potential: The performance of the reservoir was analyzed by routing the various floods listed in Table 5.1. All routings began with the reservoir level at the principal spillway crest.

5.5 Reservoir Regulation: Pertinent dam and reservoir data are shown in Table 1.1, paragraph 1.3.3.

Regulation of flow from the reservoir, except for fire-fighting supply, is automatic. Normal flows are maintained by the riser crest (elevation 301.0 feet M.S.L.). Water entering the 3 foot high by 7 foot wide rectangular openings on the north, south and west faces of the riser flows through the dam in a 42 inch diameter concrete conduit. Water flows past the dam through an ungated, earth, side-channel emergency spillway when the reservoir level rises above the crest of the emergency spillway (elevation 313.0 feet M.S.L.).

5.6 Overtopping Potential: The probable rise in the reservoir and other pertinent information on reservoir performance for the Probable Maximum Flood (PMF), 1/2 PMF and 100-year flood are shown in the following table:

## TABLE 5.1 RESERVOIR PERFORMANCE

| Item | Normal | Hydrographs 100 Year | 1/2 PMF | PMF |
|---|---|---|---|---|
| Peak flow, c.f.s. | | | | |
| Inflow | - | 1634 | 4540 | 9080 |
| Outflow | - | 334 | 3680 | 8850 |
| Peak elev., ft. M.S.L. | 301.0 | 313.7 | 321.1 | 323.7 |
| Emergency spillway (elev. 313.0 feet M.S.L.) | | | | |
| Depth of flow, ft. (a) | - | 0.3 | 4.9 | 6.7 |
| Avg. velocity, f.p.s. | - | 2.9 | 12.0 | 14.0 |
| Non-overflow section (elev. 321.0 feet M.S.L.) | | | | |
| Depth of flow, ft. | - | - | 0.1 | 2.7 |
| Duration of overtopping, hrs. | - | - | 0.2 | 1.2 |
| Average velocity, f.p.s. | - | - | - | 2.7 |
| Tailwater elev., ft. M.S.L. (b) | 282.0 | - | - | - |

(a) Actual depth at control section not including velocity head.
(b) Tailwater at time of inspection.

5.7 Reservoir Emptying Potential: The 36 inch slide gate located on the upstream face of the riser will permit withdrawal of about 135 c.f.s. with the reservoir level at the spillway crest and will essentially dewater the reservoir in about 8 hours neglecting inflow.

5.8 Evaluation: Mink Creek Dam, classified as a "small" size-"high" hazard dam, is required to pass a spillway design flood of a size between 1/2 PMF and PMF according to the Recommended Guidelines for Safety Inspection of Dams. Where there is a given range for the spillway design flood, the magnitude that most closely relates to the involved risk was selected. Due to the proximity of the homes located immediately downstream from the dam (see Photo 4), the spillway design flood is equal to the PMF.

Mink Creek Dam has a maximum discharge capacity at the top of dam of 3500 c.f.s. The dam is able to pass approximately 50 percent of the PMF without overtopping. According to its classification, the dam and spillway are insufficient to pass the PMF and therefore the spillway is considered inadequate but not seriously inadequate.

Conclusions pertain to present day conditions and the effect of future development on the hydrology has not been considered.

## SECTION 6 - DAM STABILITY

6.1 Foundation and Abutments: The bedrock at the dam site consists of phyllites or fissile greenstone which is actually a chlorite actinolite schist as described in the test boring logs and the geologic report. There is a deep zone of weathering and soft seams. Fractures are extensive. The dip of foliation ranges from $10^{\circ}$ to $45^{\circ}$ toward the east or southeast. The strike varies also because of folding. There are scattered quartz veins. The bedrock is in the Evington Group of the Precambrian System. According to the letter from E. O. Gooch and Associates (Appendix VII), pressure tests on the borings by Geotechnics, Inc. indicate that there was "very little if any water loss" in the fractured greenstone. The pressures used duplicated the normal pool of the reservoir and were performed at the cutoff trench depth of 12 feet. The soils above the bedrock are variably comprised of brown, red, micaceous, silty sand, clayey silt and silty clay with rock fragments to a maximum depth of 20 feet with an average depth of 6 feet. The soils are classified alluvium, colluvium, residuim and fill with a low permeability.

6.2 Stability Analysis

6.2.1 Visual Observations: No evidence of instability in the embankment or cut slopes was observed. No seepage was observed in the embankment, abutments or foundation that would suggest an unstable condition. The seepage flow from the toe drain (estimated at 0.3 g.p.m.) is clear and considered normal.

6.2.2 Design Data: A stability analysis was performed on the embankment by E. O. Gooch and Associates in 1976 using the dam criteria of: 15 foot top width, 3:1 upstream slope, 2.5:1 downstream slope, 33 foot height, floodplain soil $\phi = 35^{\circ}$ with C=0, embankment soil $\phi = 24^{\circ}$ with $C = 1000$ lbs./ft.$^2$ and mass weight of the soils = 120 lbs./ft.$^3$. The soil strength data was obtained from direct shear tests and appear reasonable for the soils described in the test borings. (A description of the testing procedure was not available.) The downstream side the rapid drawdown condition on the upstream face was not considered. E. O. Gooch and Associates reasoned that the full reservoir condition will exist for only a few days.

Thirty-five trial failure surfaces through the embankment and the underlying floodplain soils were studied. A copy of the Soil and Geological Studies including the stability analysis is presented in Appendix VII. The minimum factor of safety obtained was 2.64 which was considered adequate for the downstream slope. Therefore, it was considered unnecessary to remove all of the soil in the floodplain to bedrock.

6.2.3 Operating Records: No operating reports for the dam were available for this report.

6.2.4 Post-Construction Changes: No alterations of the dam were apparent since construction.

6.2.5 Seismic Stability: Mink Creek Dam is located in Seismic Zone 2. Therefore, according to the Recommended Guidelines for Safety Inspection of Dams, the dam is considered to have no hazard from earthquakes provided static stability conditions are satisfactory and conventional safety margins exist.

6.3 Evaluation: The embankment section chosen for the stability analysis was compatible with the dimensions of the dam, and the soil parameters are reasonable for the soils tested at the three locations selected. Therefore, the stability analysis is acceptable with a safety factor of 2.64.

Although the amount of drawdown from normal pool would be 11.5 feet, standard engineering practice requires stability analyses during rapid drawdown. A stability analysis on the upstream slope should be performed assuming full drawdown conditions or, at a minimum, drawdown from normal pool.

## SECTION 7 - ASSESSMENT/REMEDIAL MEASURES

7.1 Dam Assessment: The dam will pass approximately 50 percent of the PMF without overtopping, which is considered inadequate but not seriously inadequate according to criteria established by the Recommended Guidelines for the Safety Inspection of Dams for a "small" size-"high" hazard category. There were no findings as a result of this inspection that would indicate the structure of the dam is unsound. No evidence of sloughing or seepage indicating embankment distress was observed during the field inspection. The stability analyses that were provided indicated a high factor of safety on the downstream slope. No stability analyses were performed for the upstream slope.

As-built drawings and hydrology/hydraulic computations were not available for this dam. Visual inspection indicated no serious departure from design drawings.

The dam will not require urgent remedial treatment.

7.2 Recommended Remedial Measures: It is recommended that stability analyses be performed on the upstream slope assuming a full drawdown condition or, at a minimum, drawdown from normal pool. The inspection of the Mink Creek Dam revealed the following maintenance items which should be scheduled by the owner during a regular maintenance period. These are:

1) The erosion gullies on the reservoir approach slope to the emergency spillway should be filled and reseeded. The surface water should be diverted to drainage channels for protection against erosion.

2) Place compacted fill and reseed the areas behind the side walls on both sides of the impact basin to prevent erosion and allow for drainage away from the walls.

3) Remove driftwood from the upstream slope of the dam.

4) Initiate an annual maintenance and inspection program with records of the inspections.

5) Consider a formal warning system for the occupants of dwellings located downstream of the dam.

6) Reevaluate the operational procedure of closing the main gate valve to store floodwaters.

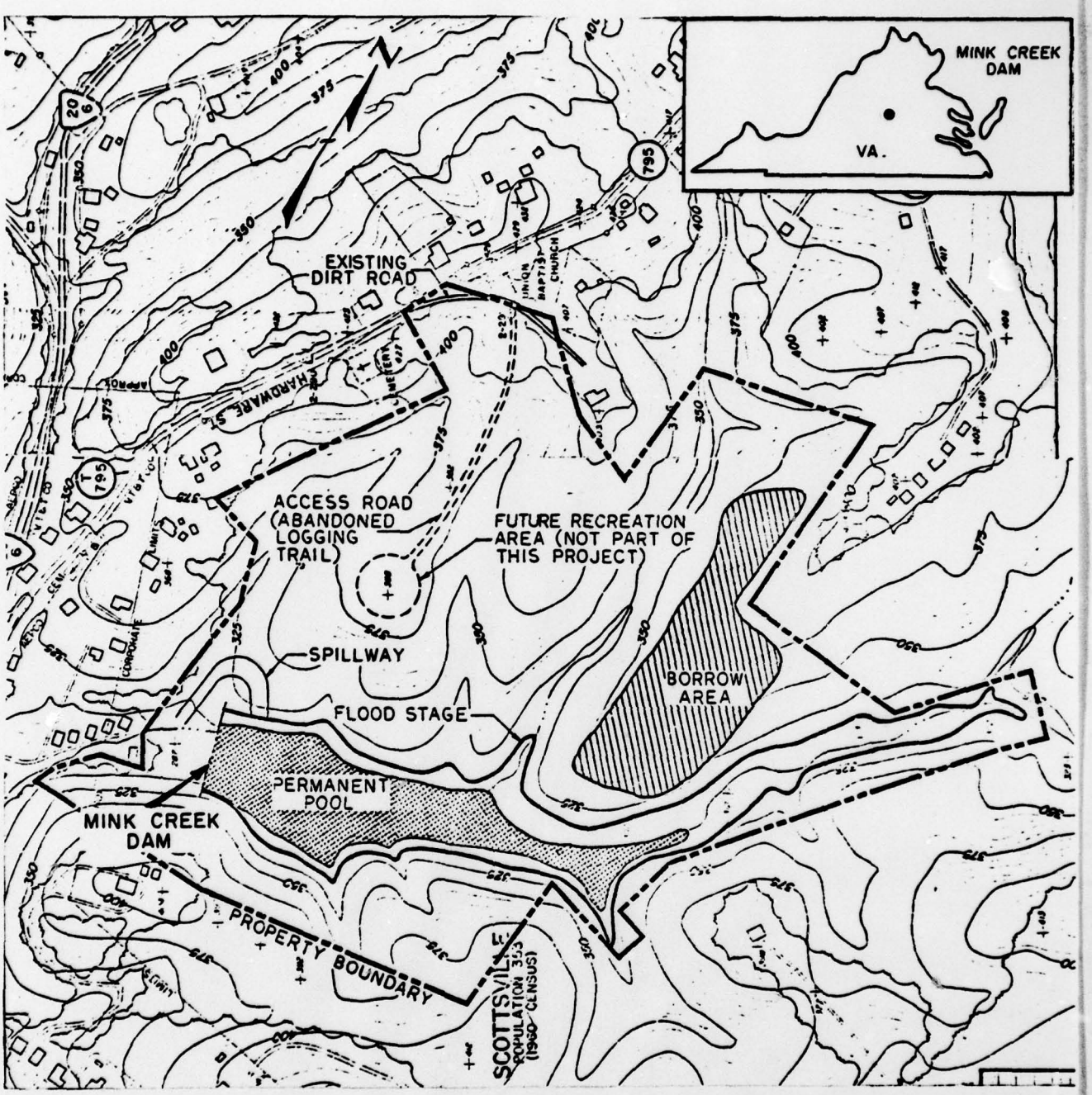
# APPENDIX I

# PLATES

CONTENTS

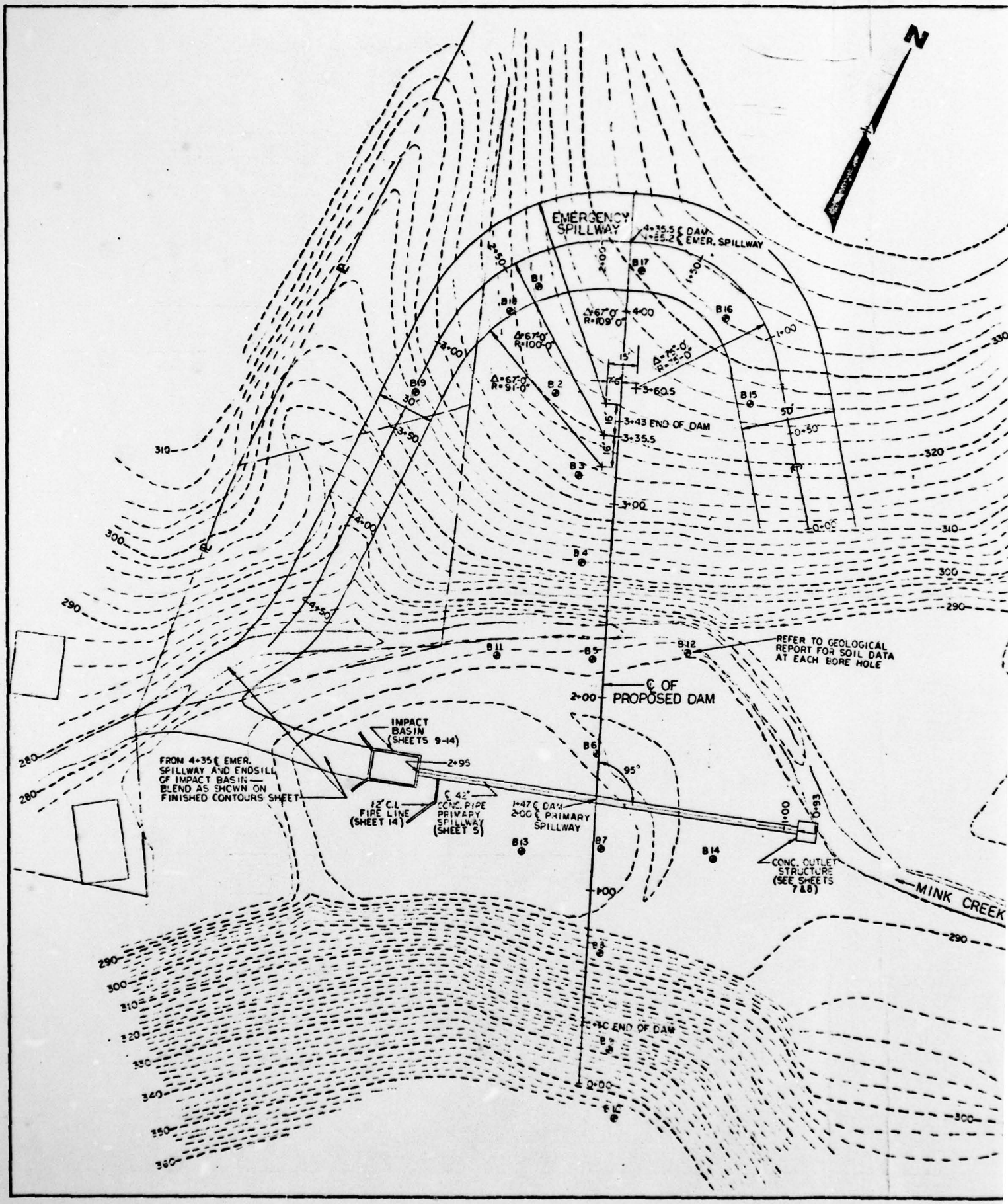


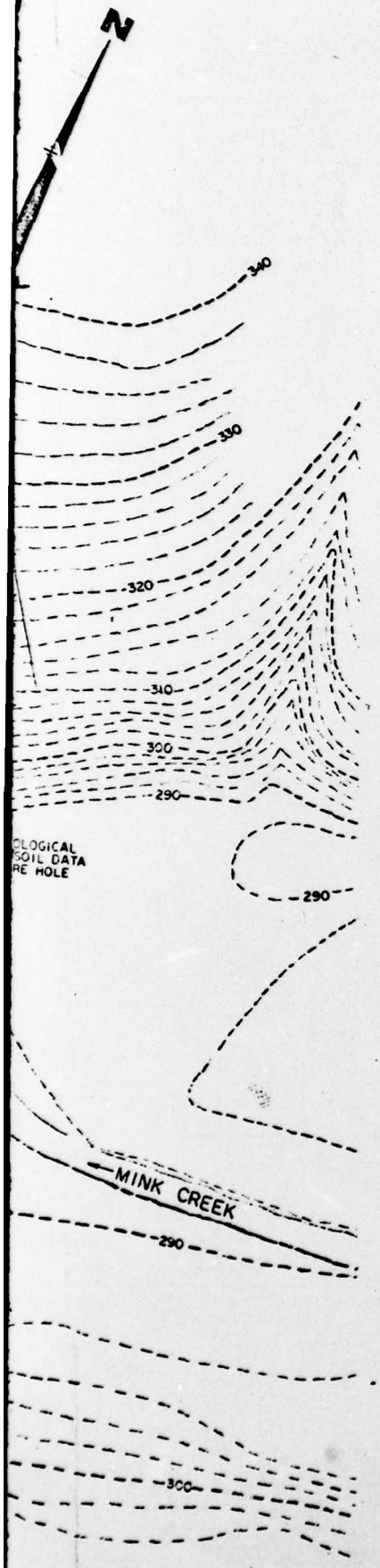
NAME OF DAM: MINK CREEK



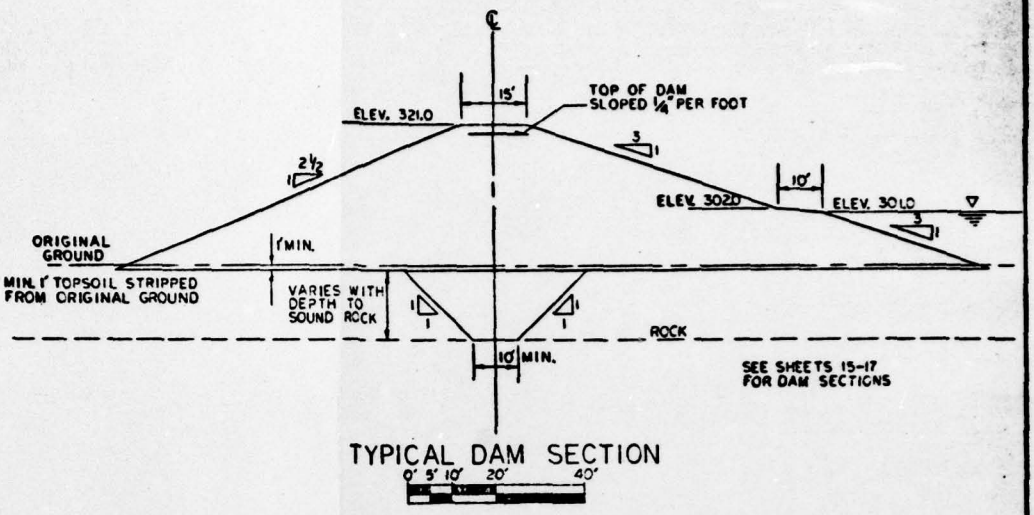

LOCATION PLAN

MINK CREEK DAM


N
EMERGENCY SPILLWAY
4+35.5 ℄ DAM
4+55.2 ℄ EMER. SPILLWAY
B17
B1
B18
B16
Δ=67°0" R=109'0"
4+00
Δ=67°0" R=100'0"
Δ=67°0" R=91'0"
B19
B2
3+60.5
B15
3+43 END OF DAM
3+35.5
B3
B4
B11
B5
B12
℄ OF PROPOSED DAM
REFER TO GEOLOGICAL REPORT FOR SOIL DATA AT EACH BORE HOLE
IMPACT BASIN (SHEETS 9-14)
B6
2+95
95°
FROM 4+35 ℄ EMER. SPILLWAY AND ENDSILL OF IMPACT BASIN — BLEND AS SHOWN ON FINISHED CONTOURS SHEET
12" C.I. FIPE LINE (SHEET 14)
℄ 42" CONC. PIPE PRIMARY SPILLWAY (SHEET 5)
1+47 ℄ DAM 2+00 ℄ PRIMARY SPILLWAY
B7
B13
B14
CONC. OUTLET STRUCTURE (SEE SHEETS 7&8)
MINK CREEK
B8
+30 END OF DAM
B9
B10
310
300
290
280
320
330
340
350
360



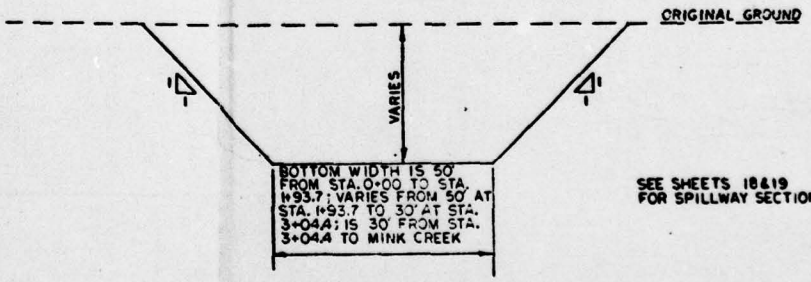

CLOGICAL
SOIL DATA
RE HOLE




SEE SHEETS 15-17
FOR DAM SECTIONS

TYPICAL DAM SECTION

0' 5' 10' 20' 40'




SEE SHEETS 18&19
FOR SPILLWAY SECTIONS

TYPICAL SECTION
EMERGENCY SPILLWAY

**PLATE 1**

MINK CREEK DAM – TOWN OF SCOTTSVILLE, VIRGINIA

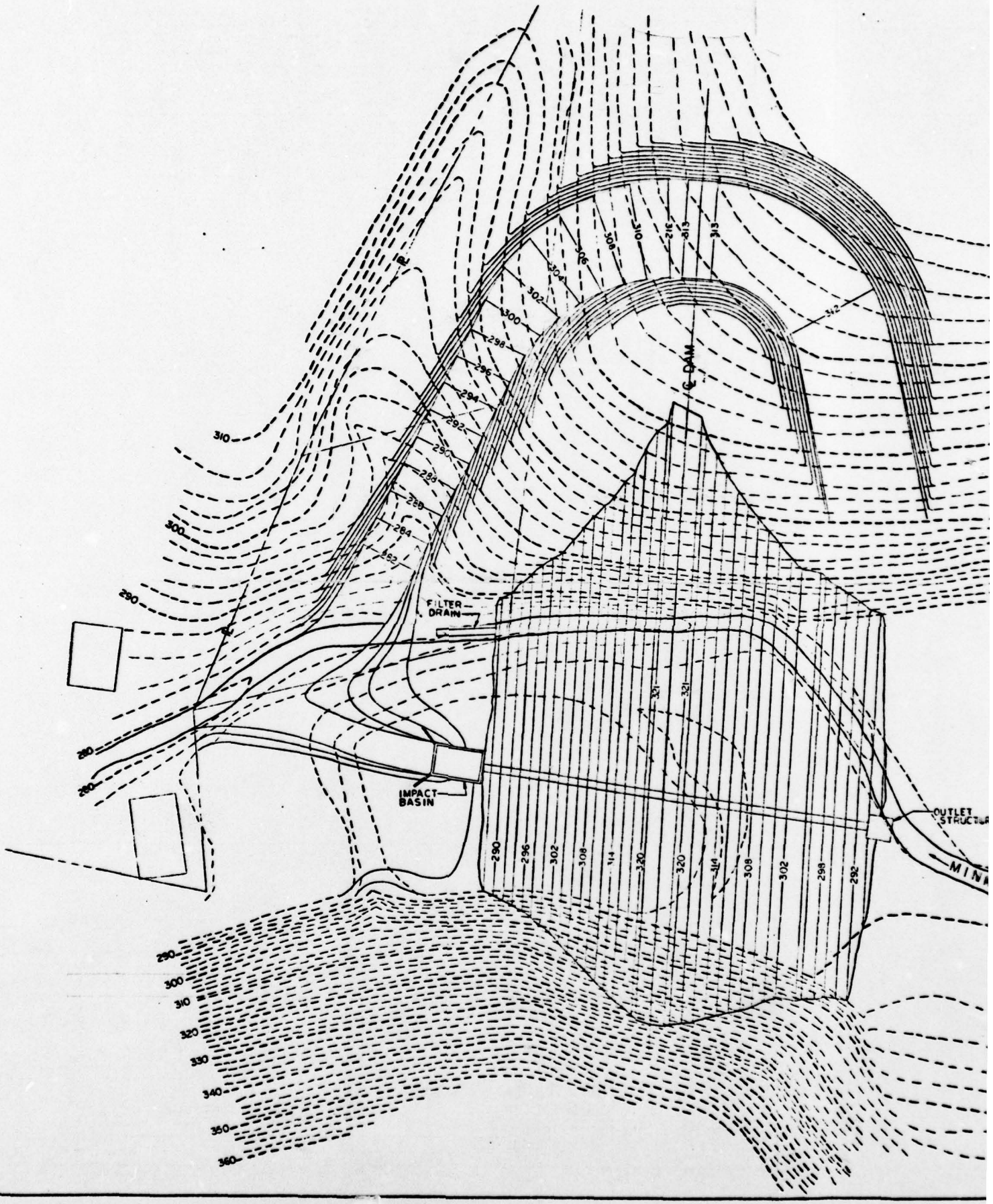
# DAM ELEMENTS, SOIL BORINGS, & TYPICAL SECTIONS

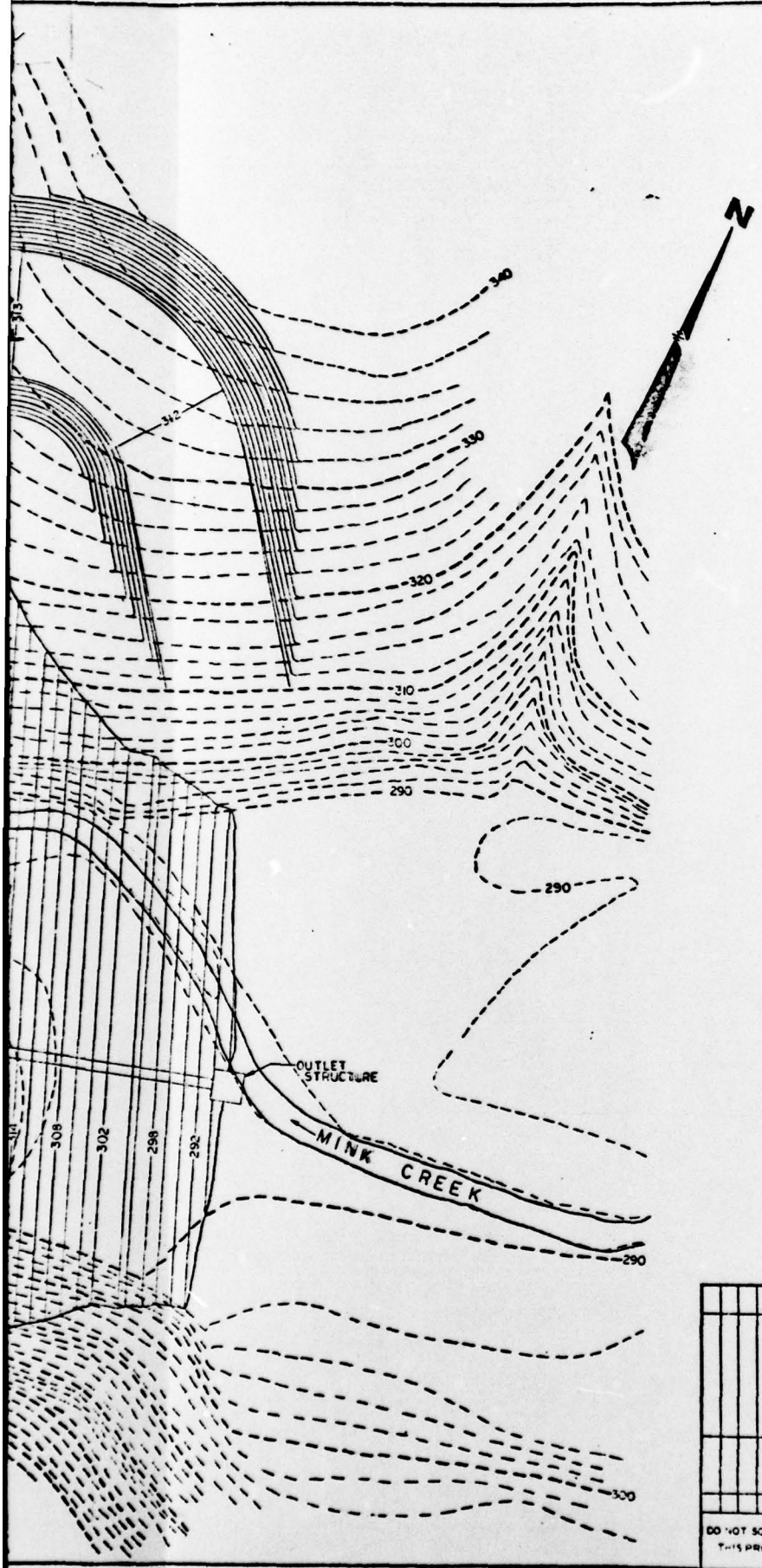
| | |
|---|---|
| DES. BY | P.W. |
| DRAWN BY | M.P. |
| APPROVED BY | R.D. |
| DATE | 1/5/76 |
| SCALE | 1" = 60' |
| SHEET | 2 OF 20 |

JOHN McNAIR & ASSOCIATES
CONSULTING ENGINEERS
WAYNESBORO, VIRGINIA

DO NOT SCALE THIS PRINT

0 30' 60' 90' 120' 150 FEET


C DAM
FILTER DRAIN
IMPACT BASIN
OUTLET STRUCTURE
MIN
310
300
290
280
270
298
296
294
292
290
288
286
284
282
304
306
308
310
312
313
314
321
320
314
308
302
298
292
330
340
350
360




# PLATE 2

MINK CREEK DAM – TOWN OF SCOTTSVILLE, VIRGINIA

## GRADING PLAN

| | |
|---|---|
| DESIGN | P. W. |
| DRAWN BY | M. P. |
| APPROVED | B. P. |
| DATE | 11/5/76 |
| SCALE AS NOTED | |

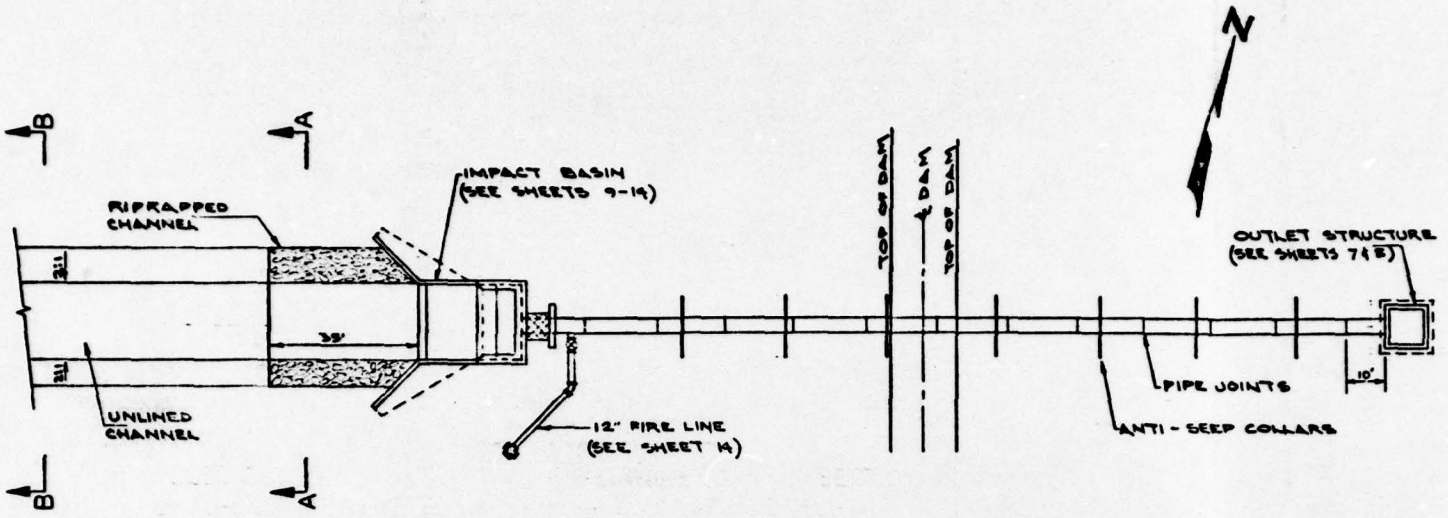
JOHN McNAIR & ASSOCIATES
CONSULTING ENGINEERS
WAYNESBORO, VIRGINIA

PROJECT NUMBER 6076 SHEET 3 OF 20

DO NOT SCALE THIS PRINT

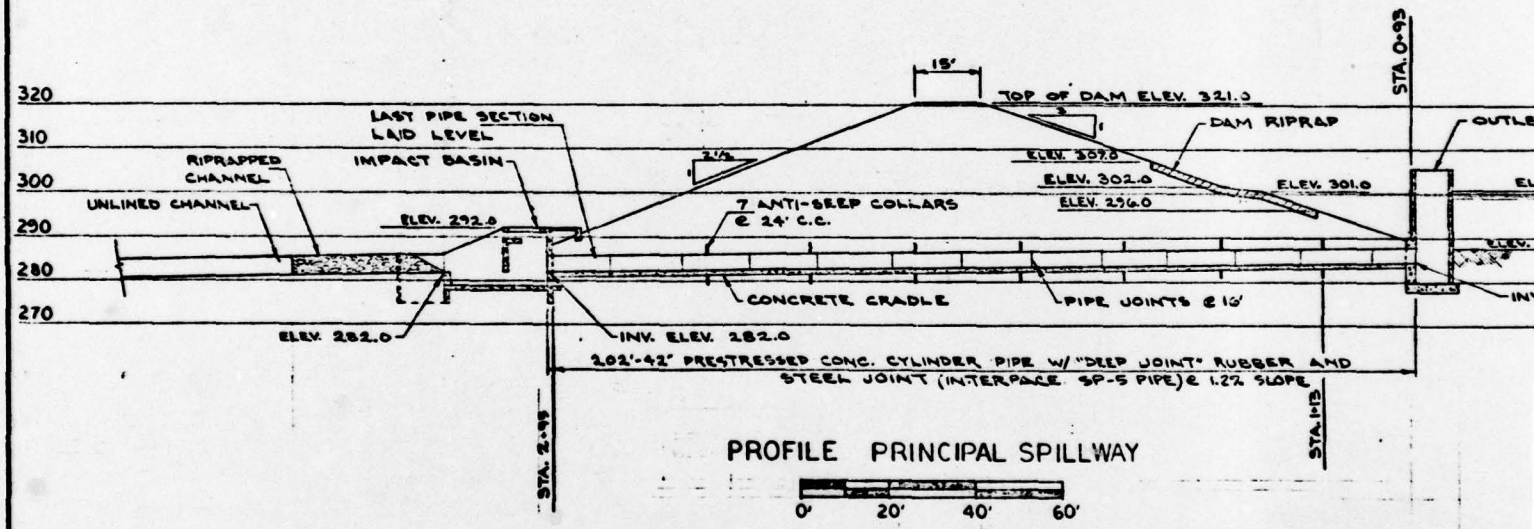
0' 30' 60' 90' 120' 150 FEET
GRAPHIC SCALE

DATE REVISION CHK



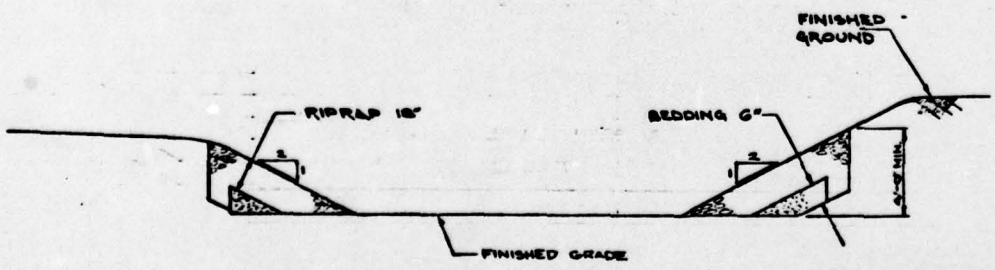

PLAN PRINCIPAL SPILLWAY

0' 20' 40' 60'



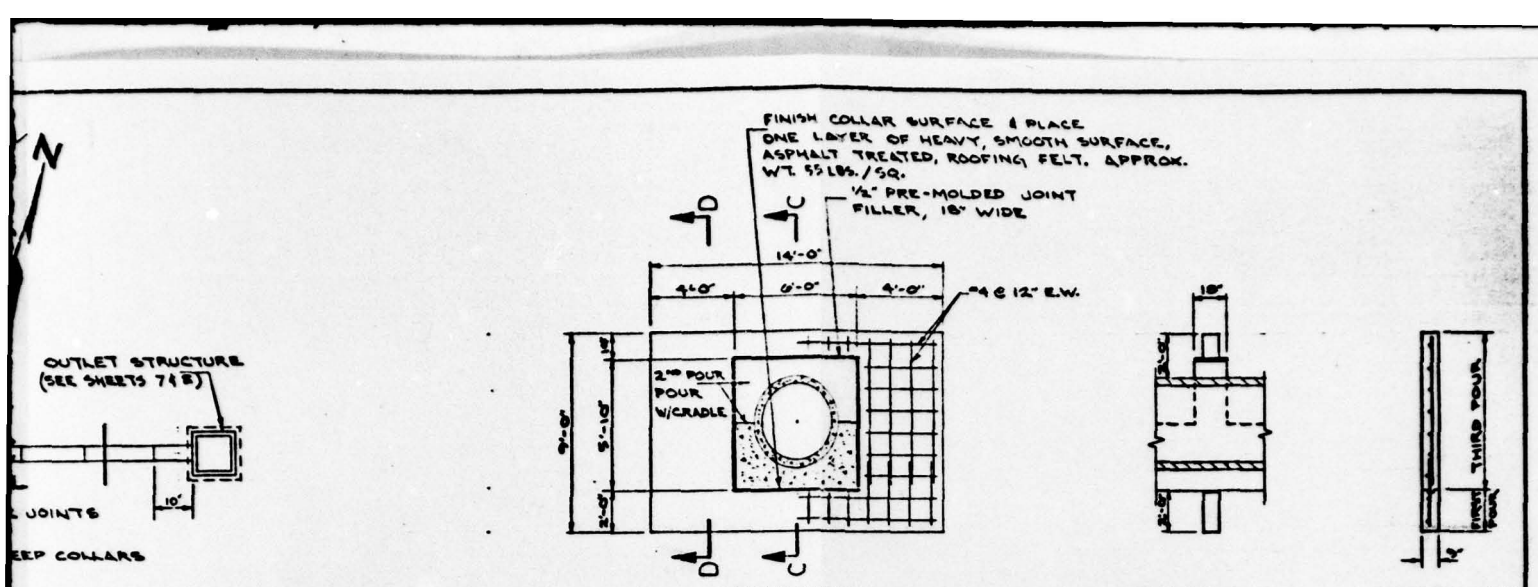

PROFILE PRINCIPAL SPILLWAY

0' 20' 40' 60'




SECTION AA

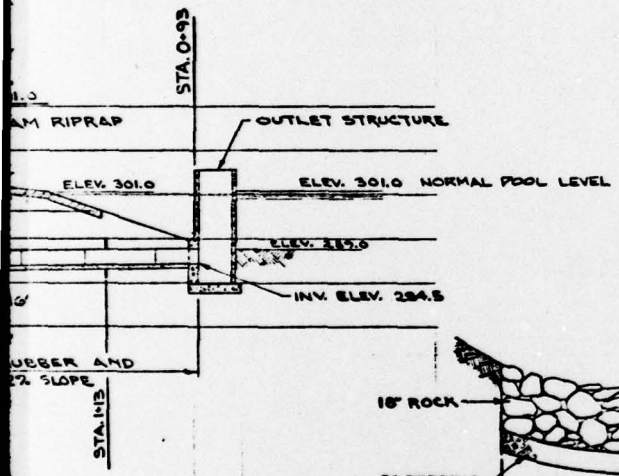
0' 4' 8' 12'

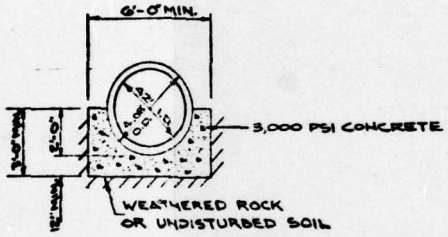



ELEVATION SECTION CC SECTION DD

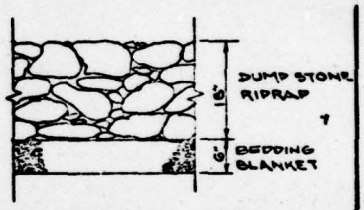
REINFORCED CONCRETE ANTI-SEEP COLLAR DETAILS

0' 4' 8' 12'

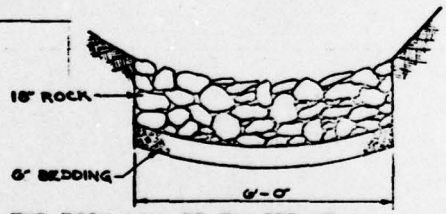



CONCRETE CRADLE
NO SCALE

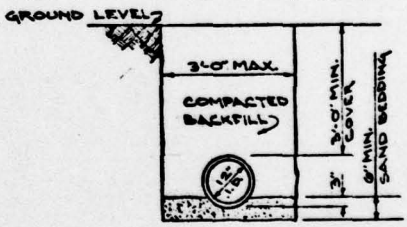



DAM RIPRAP DETAIL
NO SCALE

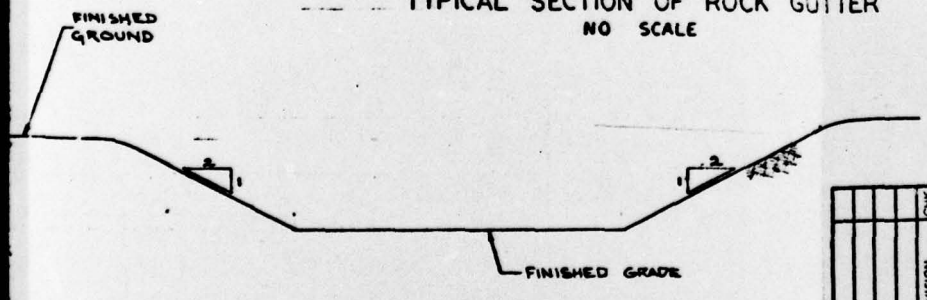



THE ROCK WILL BE PLACED AT A DEPTH OF 18" ON 6" OF BEDDING.

TYPICAL SECTION OF ROCK GUTTER
NO SCALE




TRENCH DETAIL FOR FIRE LINE
NO SCALE




SECTION BB

0' 4' 8' 12'

# PLATE 3

MINK CREEK DAM – TOWN OF SCOTTSVILLE, VIRGINIA

## PRINCIPAL SPILLWAY

| NO | DATE | REVISION | CHK |
|---|---|---|---|
| | | | |

DESIGN P.W.
DRAWN BY F.A.
APPROVED B.P.
DATE 11/5/76
SCALE AS NOTED

JOHN McNAIR & ASSOCIATES
CONSULTING ENGINEERS
WAYNESBORO, VIRGINIA

PROJECT NUMBER 6076 SHEET 5 OF 20

DO NOT SCALE THIS PRINT.

GRAPHIC SCALE

# APPENDIX II

# PHOTOGRAPHS

CONTENTS



Note: Photographs were taken on 17 November 1978.

NAME OF DAM: MINK CREEK

PHOTO 1. View of Top of Dam Looking Toward Emergency Spillway

PHOTO 2. Riser of Outlet Structure in Reservoir

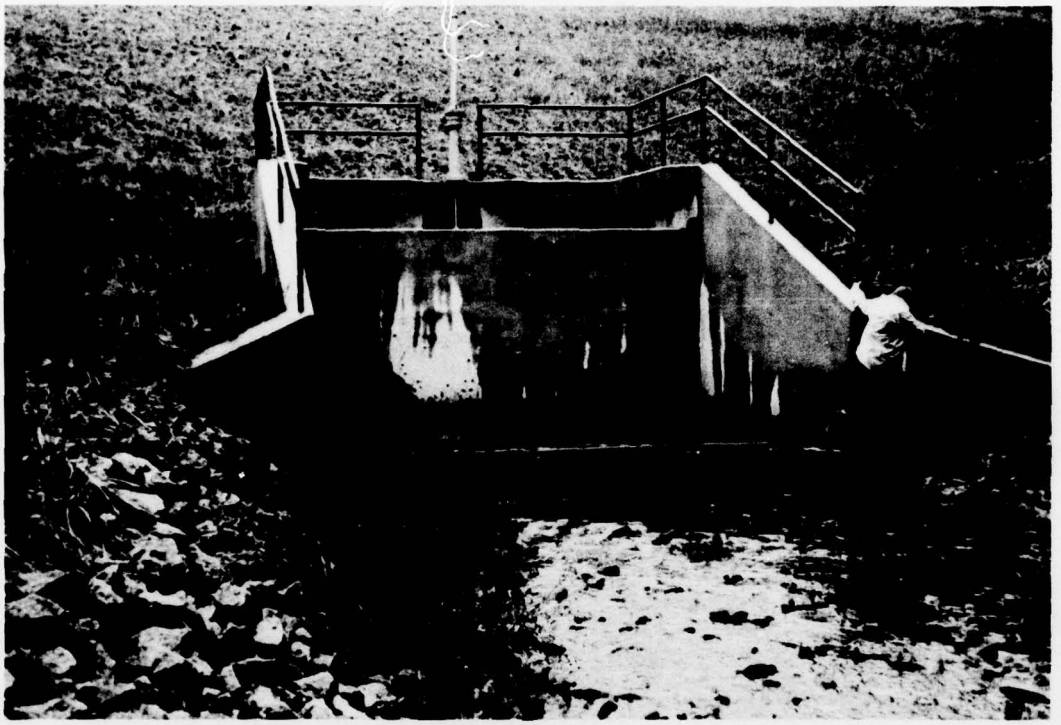


**PHOTO 3. Impact Basin Showing Baffle Wall, End Sill and Riprapped Exit Channel**

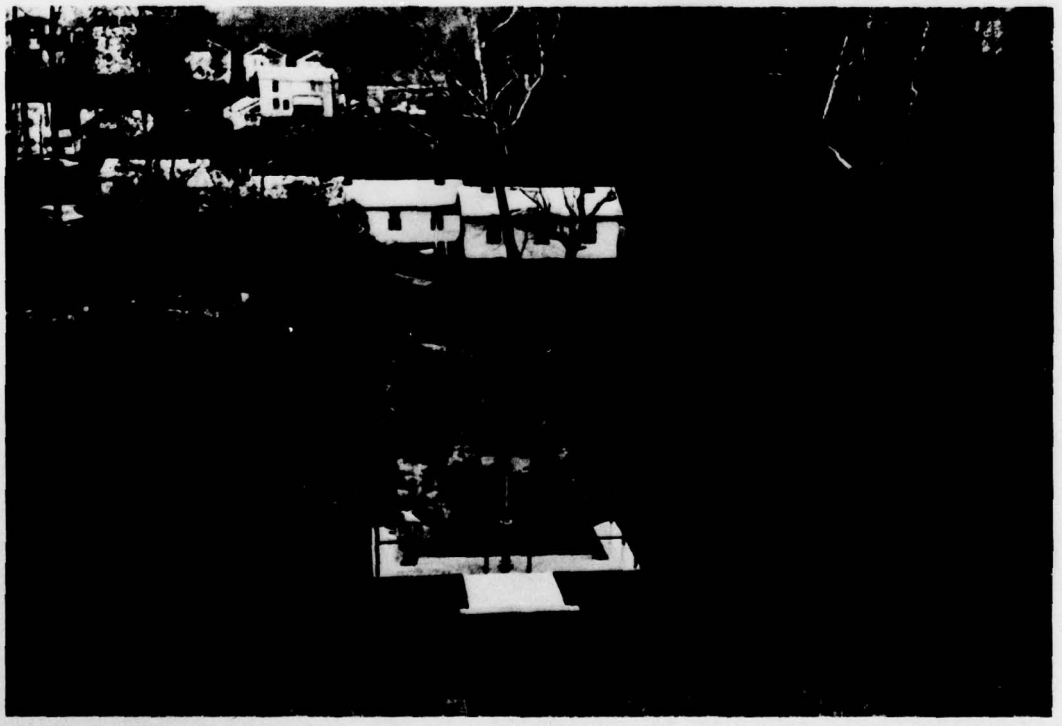


**PHOTO 4. Impact Basin, Downstream Channel, End of Emergency Spillway, (At right) and Homes in Downstream Area**

PHOTO 5. Erosion at Approach Channel to Emergency Spillway

PHOTO 6. Downstream View of Emergency Spillway

# APPENDIX III

## CHECK LIST - VISUAL INSPECTION

Check List
Visual Inspection
Phase 1

Name of Dam Mink Creek County Albemarle State Virginia Coordinates Lat. 3748.5
Long. 7829.8

Date Inspection 17 November 1978 Weather Cloudy, Rain Temperature 45°F.

Pool Elevation at Time of Inspection 301.1 ft. M.S.L. Tailwater at Time of Inspection 282.1 ft. M.S.L.

III-1

Inspection Personnel:

| Virginia Water Control Board: | Michael Baker, Jr., Inc.: | Owner's Representatives: |
|---|---|---|
| Jack Hyden | T. W. Smith<br>W. L. Sheafer<br>T. J. Dougan | Mr. Ray Thacker,<br>Mayor of Scottsville |

T. W. Smith Recorder

EMBANKMENT

Name of Dam: MINK CREEK

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SURFACE CRACKS | None observed. | |
| UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE | None observed. | |
| SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES | None observed. | |
| VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST | Good | |
| RIPRAP FAILURES | None. There is a zone of riprap (18 in. thick) on the upstream slope with a 10 ft. wide berm at the normal pool elevation where the rock extends for a height of 11 ft. as shown on the plans. The sizes of the hard stone were observed to range from 2 to 18 in. There is some minor growth of weeds and grass between the rocks. Scattered small driftwood was observed. | It is recommended that the larger driftwood be removed. |

## EMBANKMENT

Name of Dam: MINK CREEK

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SLOPES | The upstream slope ratio is 3:1 and the downstream slope was 2.5:1. The grass cover is adequate and complete. No erosion of significance was observed. | |
| CONSTRUCTION MATERIALS | The dam was constructed of unzoned homogeneous material which was observed to be clayey silt with rock fragments on the surface. | |
| JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM | There is a light-green, soft to medium hard, fissile phyllite with a thin cover of brown, damp, clayey silt with rock fragments at both abutments. The contacts appeared to be firm and water tight. Grass covered rock gutters (18 in. thick) are provided at the downstream embankment abutments. The emergency spillway is located approximately 50 ft. right of the right abutment. The upstream gutters are unlined but vegetated. | |
| ANY NOTICEABLE SEEPAGE | The clear seepage observed is described in "DRAINS". | |
| STAFF GAGE AND RECORDER | None | |
| DRAINS | There is a sand filter (2 ft. thick) over a gravel toe drain (18 in. minimum depth) across the downstream toe with an outlet in a filter drain near the bottom of the rock gutter at the abutment on the right side. There a minor flow (estimated at 0.3 g.p.m.±) of clear water into the lower part of the emergency spillway. | The flow from the filter drain is not significant. |

## EMBANKMENT

Name of Dam: MINK CREEK

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| FOUNDATIONS | The dam is founded on green, micaceous, clayey silt with greenstone fragments. The bottom of the cutoff trench is on sound phyllite or greenstone with quartz veins and sandy zones. The dip of the foliation varies from 10° to 45°SE. The bedrock is in the Evington Group of the Precambrian System. A grout curtain (30 to 40 ft. deep into the bedrock) was provided to seal the fractures. | |

## OUTLET WORKS

Name of Dam: MINK CREEK

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CRACKING AND SPALLING OF CONCRETE SURFACES IN OUTLET CONDUIT | All concrete surfaces are in excellent condition. | |
| INTAKE STRUCTURE | The concrete of the intake tower is in excellent condition. The tower consists of a square concrete riser with a 3 x 7 ft. opening on 3 of its sides. | |
| OUTLET STRUCTURE | The outlet structure is a concrete impact basin with a baffle wall and end sill. The basin is about 17.5 ft. wide and 25 ft. long. The soil backfill near the ends has settled slightly. | Compacted fill should be placed behind the walls of the impact basin to prevent erosion from normal runoff from the embankment. |
| OUTLET CHANNEL | There is approximately 40 ft. of hard riprap stone on the banks with greenstone bedrock in the bottom of the channel downstream from the impact basin. | |
| EMERGENCY GATE | A 3 ft. square sluice gate on the upstream side of the intake tower can be opened to drain the reservoir through the outlet conduit. | |

# UNGATED SPILLWAY

Name of Dam: MINK CREEK

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CONTROL SECTION | The vegetated, side-channel, emergency spillway is laid out on an approximate 90° curve with a 15 ft. wide vegetated earth and rock control section located approximately 200 ft. from the beginning of the spillway. The emergency spillway is about 450 ft. long. | |
| APPROACH CHANNEL | Erosion has cut several gullies 2.5 ft. deep x 2 ft. wide in clayey silt with rock fragments down to phyllite which dipped at 30°-40° into the reservoir at the shoreline. Thin slabs have been loosened and a 15 ft. long delta has been formed in the reservoir. The soil cover decreases to 0.1 ft. further down the channel. The approach channel has an adverse slope of about 1.5%. | The gullies should be filled, compacted and seeded to prevent further erosion. It may be necessary to divert drainage with a cross ditch. |
| DISCHARGE CHANNEL | Clayey silt covers weathered phyllite in the discharge channel at a variable depth. There is clear seepage near the intersection of a small stream coming from a gully on the right side but at a higher elevation. The seepage was estimated at less than 1 g.p.m. The spillway conveys the water into the stream channel. The exit slope exceeds 10%. | |
| BRIDGE AND PIERS | There is a small, wooden-deck bridge located about 100 ft. downstream of the dam. It is in poor condition and might wash away during a high outflow. The bridge is about 8 ft. wide and could not support vehicular traffic. | |
| CUT SLOPES | The slopes have been cut at a uniform 1:1 ratio in phyllite and red, clayey silt above and at the approach limit. The slopes for the approach channel has signs of erosion in the soft weathered rock and thicker soil cover. The grass on the slope has been partially washed away. The channel curves south at the dam centerline and the fractured strata dips at 30° into the channel causing breakage and rock talus on the right | |

(continued on next page)

## UNGATED SPILLWAY

Name of Dam: MINK CREEK

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CUT SLOPES (continued) | side of the curve. The cut slope in most of the discharge channel has limited breakage on the right except near the dam centerline. The cut slope on the left side adjacent to the dam is more stable than the right except for some sloughage and erosion for the approach channel section. The rock breakage and sloughage is not excessive. | |

## INSTRUMENTATION

Name of Dam: MINK CREEK

| VISUAL EXAMINATION | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| MONUMENTATION/SURVEYS | None observed. | |
| OBSERVATION WELLS | None observed. | |
| WEIRS | None | |
| PIEZOMETERS | None | |
| OTHER | | |

RESERVOIR

Name of Dam: MINK CREEK

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| SLOPES | The slopes on the left side are steep and wooded with damp, clayey silt and rock fragments overlying phyllite which is exposed in a few areas. The slopes on the right side are gentle to moderate with light woods. The soil consisted of brown, damp, clayey silt with some rock fragments. | |
| SEDIMENTATION | No unusual sedimentation was observed. | |

## DOWNSTREAM CHANNEL

Name of Dam: MINK CREEK

| VISUAL EXAMINATION OF | OBSERVATIONS | REMARKS OR RECOMMENDATIONS |
|---|---|---|
| CONDITION (OBSTRUCTIONS, DEBRIS, ETC.) | The channel is well-defined and there are no obstructions. | |
| SLOPES | There are sandy silt and rock fragments in the 2:1 slopes. | |
| APPROXIMATE NO. OF HOMES AND POPULATION | The downstream channel curves to the left where 5 homes are located approximately 100 to 300 feet downstream of the dam. Scottsville, with a population of about 200, lies only 1000 feet downstream of the dam. | |

# APPENDIX IV

## CHECK LIST - ENGINEERING DATA

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

Name of Dam: MINK CREEK

| ITEM | REMARKS |
|---|---|
| PLAN OF DAM | A plan view of the dam from design drawings is included in this report (Plates 1 and 2). |
| REGIONAL VICINITY MAP | A vicinity map is included as the Location Plan. |
| CONSTRUCTION HISTORY | The dam was constructed by Moore Golf, Inc. of Culpeper, Va. |
| TYPICAL SECTIONS OF DAM | Typical sections of the dam from the design drawings are shown on Plates 1 and 3. |
| HYDROLOGIC/HYDRAULIC DATA | None was available for this report. |
| OUTLETS - PLAN and DETAILS | are contained in the design drawings. |
| - CONSTRAINTS and DISCHARGE RATINGS | none were available for this report. |
| RAINFALL/RESERVOIR RECORDS | No rainfall records are available at the dam. |

Name of Dam: MINK CREEK

| ITEM | REMARKS |
|---|---|
| DESIGN REPORTS | The contract documents were the only design reports available. |
| GEOLOGY REPORTS | A soil and geologic report with boring records and test results was available. The report was prepared by E.O. Gooch and Associates (Consulting Geologists and Engineers). |
| DESIGN COMPUTATIONS<br>HYDROLOGY & HYDRAULICS<br>DAM STABILITY<br>SEEPAGE STUDIES | A summary section in the geologic report presents the data and results of an embankment stability analysis. A supplemental engineering study of the emergency spillway was also available. |
| MATERIALS INVESTIGATIONS<br>BORING RECORDS<br>LABORATORY<br>FIELD | Boring records, pressure test data and laboratory test results are presented with the contract documents and the soil and geologic report. |
| POST-CONSTRUCTION SURVEYS OF DAM | No known post-construction surveys have been made. |
| BORROW SOURCES | The borrow areas are shown on the design drawings. |

Name of Dam: MINK CREEK

| ITEM | REMARKS |
|---|---|
| MONITORING SYSTEMS | No monitoring system was apparent. |
| MODIFICATIONS | Since field measurements taken during the inspection verify the design drawings, no major modifications are apparent. |
| HIGH POOL RECORDS | No records are available since dam was just completed in 1977. |
| POST-CONSTRUCTION ENGINEERING STUDIES AND REPORTS | None were available. |
| PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS | None |
| MAINTENANCE OPERATION RECORDS | No maintenance records were available. A report entitled "Mink Creek Dam Operation" discusses operation procedures. |

Name of Dam: MINK CREEK

| ITEM | REMARKS |
|---|---|
| SPILLWAY PLAN<br><br>SECTIONS and DETAILS | are contained in the design drawings. |
| OPERATING EQUIPMENT PLANS & DETAILS | are contained in the design drawings. |

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 0.92 sq.mi.

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 301.0 ft. M.S.L. (30 ac.-ft.)

ELEVATION EMERGENCY SPILLWAY CREST (STORAGE CAPACITY): 313.0 ft. M.S.L. (88 ac.-ft.)

ELEVATION MAXIMUM DESIGN POOL: Unknown

ELEVATION TOP DAM: 321.0 ft. M.S.L.

CREST: Emergency Spillway

a. Elevation 313.0 ft. M.S.L.
b. Type Earth side-channel with vegetative cover
c. Width 50 ft.
d. Length 450 ft. total (180 ft. approach, 15 ft. level section, 155 ft. exit)
e. Location Spillover Outside right abutment
f. Number and Type of Gates None

OUTLET WORKS:

a. Type Drop-inlet concrete riser
b. Location Riser in reservoir with 42 in. R.C.P.
c. Entrance inverts 301.0 ft. M.S.L. (normal pool)
d. Exit inverts 282.0 ft. M.S.L. (outlet 42 in. R.C.P.)
e. Emergency draindown facilities 36 in. slide gate

HYDROMETEOROLOGICAL GAGES: None at dam site

a. Type
b. Location
c. Records

MAXIMUM NON-DAMAGING DISCHARGE 500 c.f.s. (estimated in report by McNair Assoc.)

Name of Dam: MINK CREEK

# APPENDIX V

## SUPPLEMENTAL ENGINEERING STUDY
## MINK CREEK DAM EMERGENCY SPILLWAY
## SCOTTSVILLE, VIRGINIA

# SUPPLEMENTAL ENGINEERING STUDY

# MINK CREEK DAM EMERGENCY SPILLWAY

# SCOTTSVILLE, VIRGINIA

John McNair and Associates
Consulting Engineers
Waynesboro, Virginia

April 21, 1977

## PURPOSE

The purpose of this report is to evaluate the safety of the Mink Creek Dam emergency spillway as presently designed. Specifically, three basic questions will be addressed, these being:

1. With the spillway as presently designed, under what storm conditions could the dam fail? What is the return period for the storm which would cause failure?
2. If failure of the dam occurs, what would be the effect on downstream structures and property?
3. If the emergency spillway was enlarged to increase its capacity, what would the cost be and what would the increased capacity mean as far as the possibility of failure of the dam?

## DISCUSSION

The existing emergency spillway has a maximum capacity of approximately 3,000 cubic feet per second (cfs). In order to predict the size storm which would generate this quantity of flow, flood hydrographs for the Mink Creek drainage area were prepared based on theoretical models of similar drainage basins. The actual size of the rainstorm required to produce a flow of 3,000 cfs depends upon the condition of the soil cover preceeding the rain. Under normal ground conditions (ground not saturated from previous rains), a rainstorm of 14 inches in a six hour period will produce a peak flow of approximately 3,000 cfs. If it is assumed that the ground is completely saturated prior to the occurrence of a rainstorm, a 12-inch rain over a six hour period will produce a peak flow of approximately 3,000 cfs.

the beginning of the storm. It is normally assumed that the PMP will not occur at the same time as saturated ground conditions.

Two methods were used in an attempt to quantify the return periods of storms having a rainfall intensity of 12 and 14 inches in a six hour period. The first method is the method developed by Gumbel [1] which is used to predict the return period for extreme values for which data is not available. Rainfall in inches per 6 hour period was plotted against recurrence interval in years on special probability paper. Rainfall intensities for various return periods were taken from a series of curves developed by the U. S. Weather Service for Lynchburg. When rainfall intensities were plotted against recurrence interval in years for 2, 5, 10, 25, 50 and 100-year storms, the plot results in a straight line. With this procedure, it is theoretically possible to predict the recurrence interval of large storms. Using this method, a storm with a recurrence interval of 1,000 years results in an 8-inch rainfall in a six hour period. Projecting the line even further for a 12-inch rainstorm results in a return period of 100,000 years. The use of this technique to estimate return periods results in rather large numbers which begin to become meaningless for the size storm we are concerned with.

Another method was also used in an attempt to determine the return period. DeWiest and Waters [2] used the Weather Service rainfall intensity frequency curves in an effort to predict rainstorms beyond the 100 year period. This method uses an arithmetic plot of the precipitation in a six hour period plotted against the return period in years. Plotting precipitation in

a six hour period versus return period and projecting beyond the 100-year storm results in a graph in which the return period for storms greater than the 100-year storm can be estimated. Using this method, a 12-inch rainstorm in a six hour period has a return frequency of approximately 600 years. A 14-inch rainstorm in a six hour period has a return frequency of approximately 750 years. It should be mentioned that a rainstorm with a return period of 100 years has a magnitude of approximately 5.5 inches in a six hour period.

Use of such terms as the 600 year storm might lead erroneously to the conclusion that such storms might never happen. Such is not the case, since such storms have occurred as evidenced by the record storms mentioned previously. Such storms have occurred in the past and probably will occur again in the future. The difficulty is attempting to predict the return period for such a large size storm in a particular area.

The spillway meets, with one exception, the criteria for all of the record storms which have occurred. However, the possibility does exist that a storm exceeding 14 inches could occur. Indeed, such a storm could occur in the year following completion of the dam. Because of the large storm required to produce a flow exceeding 3,000 cfs, pinpointing the exact return period of such a storm is as much a matter of conjecture as it is a matter of exact analytical analysis.

The next question concerns the affect on the population and property downstream from the dam should the dam fail. Prior to discussing impact of dam failure, it is important to consider the

effects downstream should the emergency spillway operate. Should a 14-inch rainstorm occur, the emergency spillway would be operating at peak capacity but the dam should not fail. The houses immediately downstream from the dam would be the most adversely affected should the emergency spillway operate at its peak capacity. The stream bed at this point is only about 10 feet wide and has a carrying capacity of only about 500 cfs. Should the emergency spillway be operating at peak capacity (3,000 cfs), there would be a tremendous amount of turbulence at the point where the emergency spillway enters the stream bed. Erosion will most likely occur in the area immediately downstream from the dam where the steep slope from the emergency spillway meets the gradual slope of the stream bed. In addition, water from this emergency spillway will spill out of the existing stream bed into the narrow confines of the valley. The extent of damage depends upon the amount of water which the emergency spillway is carrying. If only about 500 cfs flows over the emergency spillway, little damage would actually occur since the stream could probably handle this amount of flow from the spillway. The portion of Mink Creek which runs through town has a carrying capacity of approximately 700 cfs. Should the emergency spillway be operating at peak capacity, localized flooding will probably occur in the town because of the limited carrying capacity of the stream.

The damage which would occur to the dam should the flow exceed 3,000 cfs is dependent upon the duration of overtopping as well as the height of water over the dam. It is estimated that if the peak flow reaches 3,500 cfs, the height of water over the dam will

be approximately 6 inches. If peak flow reaches 8,000 cfs, height of water over the dam will be approximately 2.5 feet. Should the dam be overtopped, it is most likely (but not certain) that the dam will fail. Normally, earthen dams do not fail instantaneously and release all water behind the dam at one time. Failure of the dam would probably be gradual with water being released as the dam fails. It is almost impossible to predict with any degree of accuracy the exact volumes or flows which would move down the valley floor through the town. Undoubtedly, the entire area lying in the valley floor both immediately downstream of the dam and the town itself would be severely damaged.

Should a storm occur large enough to overtop the dam, there would be only a short amount of time between the filling up of the water impoundment pond behind the dam, operation of the emergency spillway, and overtopping of the dam. Because of the small drainage area behind the dam, the flood would reach a peak very quickly. (The peak would also pass very quickly.) Using the unit hydrograph developed for the drainage basin for a 28-inch rain in a 6 hour period, the time between when the emergency spillway began operation and overtopping of the dam would only be about 1 hour. Should such a storm occur, evacuation procedures would have to be started quickly in order to insure safety of persons below the dam.

It is interesting to consider what would happen to the town should no dam be present. If a rainstorm of 14 inches in six hours occurred the peak flow would still be approximately 3,000 cfs. In the narrow valley immediately downstream from the dam site, the average depth of water in the valley would be approximately 3 feet with depths in the stream being greater than 3 feet with less water on the higher sides of the valley. In the portion of town along

Mink Creek the average depth would be approximately 2 feet of water with greater depths in the area of Mink Creek and lesser as it spreads out in the higher valley sides. If a storm of 28 inches fell in six hours, the depths and flows would be much greater. The storm would peak at approximately 8,000 cfs which would cause the water to rise to about 6 feet in the narrow valley immediately downstream from the dam site with about 4 feet of water in the town. The occurrence of such floods without the dam would also cause damage to the town and would also provide little warning to the residents concerning the occurrence of such a flash flood.

The last question addressed by this study is the possibility of expanding the capacity of the spillway above 3,000 cfs and predicting the return period for the expanded spillway. The existing dam site limits the size of the spillway that could be installed because of existing property lines and the location of the houses immediately downstream from the dam. It is possible to install a 70-foot wide spillway (as opposed to a 50-foot spillway as presently designed) at the existing site without infringing upon property lines and the dam. Such a spillway would have a capacity of approximately 4,500 cfs. This would give adequate capacity to meet the peak flow from a storm of 18 inches in a six hour period. Using the method described previously, this would place the return period for the storm somewhere in the neighborhood of 1,000 years. Estimated cost of increasing the capacity of the spillway to 4,500 cfs is approximately $20,000 for the extra earth work involved to widen the spillway. This does not include the cost of any concrete lining that may have to be installed in the spillway to protect

against erosion when the spillway is in operation. Although expansion of the spillway to 70 feet provides some additional safety factor (an 18-inch storm as opposed to a 14-inch storm, or a return period of 1,000 years as opposed to 750 years) the actual safety factor involved is rather small when discussing such large size storms. In order to pass the maximum flood, the spillway would have to be sized to carry peak flow (8,000 cfs) caused by the Probable Maximum Precipitation of 28.5 inches in a six hour period. To provide this capacity, the emergency spillway would have to be 125 feet wide. No attempt was made to assign a return period to this size storm since it is considered to be the maximum precipitation that could occur. An additional cost of at least $85,000 would be incurred by construction of such a spillway. As mentioned before, the present location of property lines and presence of houses immediately downstream from the dam preclude the construction of such a spillway without procurement of additional space and land downstream from the dam. The cost mentioned above does not include procurement of the additional real estate required nor the added cost of liner should it be required.

While construction of 125-foot spillway would protect the dam from overtopping should the PMP occur, a great deal of damage would still occur in the town because of the peak flow (8000 cfs) being discharged through the spillway.

## SUMMARY

The emergency spillway as presently designed will safety pass peak flow from a storm with a precipitation of 14 inches in a 6 hour

period under normal ground conditions or a storm with 12 inches precipitation in a 6 hour period under saturated ground conditions. Estimated return period for these storms is 750 years and 600 years, respectively. Larger storms with greater return periods will cause damage to the dam due to overtopping. The degree of damage is dependent upon the duration and magnitude of the peak flow. Failure of the dam would probably be gradual but would cause a great deal of damage downstream. If the spillway were enlarged to pass the peak flow from the Probable Maximum Precipitation, the spillway would have to be 125 feet wide costing at least $85,000 (excluding cost of additional property acquisition). No matter what size emergency spillway is provided, flooding and damage will occur if peak flow from large rainstorms (i.e. 14 or 28 inches) is discharged over the spillway. With or without the dam, considerable downstream damage can be expected from flooding caused by extreme rainfalls.

REFERENCES

1. Gumbel, E. J., "Statistical Theory of Extreme Values and Some Practical Applications", U. S. National Bureau of Standards-Applied Mathematics, Series 33 (February 1954)

2. De Wiest, R. J. M. and G. Waters, "An Investigation Into Proposals for Flood Control on San Franciscquito Creek", Student Report, Stanford University, 1958

# APPENDIX VI

# MINK CREEK DAM OPERATION

# MINK CREEK DAM OPERATION

## Description of the Facility

Mink Creek dam is a flood-control facility located in Albemarle County, Virginia.

The dam creates an impoundment of water on Mink Creek that prevents flooding of the northern part of Scottsville. The dam is an earthen embankment about 35 feet high by 320 long. The embankment is about 205 feet wide at the bottom and 15 feet wide at the top.

The main parts of the facility in addition to the embankment are as follows:

1. The water outlet structure (tower)
2. The primary spillway (42 inch diameter pipe)
3. The impact basin
4. The emergency spillway
5. Grout curtain which underlies the centerline of the dam.

The outlet structure contains two gates, a 36" drain gate for emptying the lake, and a 42" gate for closing the primary spillway for maintenance and pipe inspection. Controls for the gates are on top of the outlet structure. The outlet structure contains three (3) trash racks whose lower level is 301 feet above mean sea level. This controls the lake to this level by allowing the water to flow over

the trash racks, into the outlet structure, through the primary spillway, out the impact basin and down Mink Creek into the James River.

The primary spillway is a lock-joint cast iron, concrete lined, 42 inch pipe that is 202 feet long. It connects the outlet structure to the impact basin and runs under the dam perpendicular to the center line.

The impact basin is a concrete box that catches the water from the primary spillway and dissipates the energy of the water so that it gently flows on down the creek to the river. The energy is dissipated by hitting a baffle wall and falling into a sump before flowing downstream. The entry from the pipe into the impact basin is controlled by a 42 inch sluice gate. This is the main gate for controlling water flow into Mink Creek. This same gate would be used with some other operations to get water into the fire line for emergency fire use.

The emergency spillway is a 50 feet wide trench that bypasses the dam. Its purpose is to keep water from ever going over the top of the dam. It does this by letting the water flow around the dam. The normal level of water in the lake is 301 feet. When a rain occurs the water that runs off from the rain will flow through the outlet structure. If a storm with heavy rain occurs the outlet structure and the primary spillway may not be able to carry off the water so the lake fills up. Under normal condition the lake will contain 30 acre-feet

of water, covering 5½ acres of area and fill to 301 feet above mean sea level. A heavy storm could fill the lake to 313 feet above mean sea level with 88 acre-feet of water covering an area of 11 acres. The dam would store 58 acre-feet of water or the amount of water from 8½ inches of rain in six hours. More that this rain would run off through the emergency spillway which is at a level of 313 feet above mean sea level. This maximum storage level is eight feet below the top of the dam which is at 321 feet above mean sea level. Since the channel of the emergency spillway is below the top of the dam, the water will flow around the dam rather than ever flow over it. This is the basic purpose of the emergency spillway.

The grout curtain is a layer of neat cement that was pumped into the bed rock before the concrete pipe and the earth fill were put in place. This grout was pumped into the drill holes at a depth of 30 to 40 feet to seal off any cracks so that the dam would be tight and not leak. Though the grout curtain is not visible it is there and doing its job.

Problem of Flooding

The Town of Scottsville is situated close to the James River at Horseshoe Bend. It was situated close to the river to handle the river transportation of a century and a quarter ago. Mink Creek runs south through the Town and empties into the James River. Mink Creek drains a 600 acre watershed to the east and a 300 acre watershed to the west. After a heavy rain, the east watershed will carry about four to five times as much

water as the west watershed. Mink Creek dam has been built to retain water from the east watershed. The basic problem of flooding is that when the James River is full of water and there is a heavy rain on the east watershed -- there is no place for the Mink Creek water to go, so it floods the Town.

Storm on Mink Creek Watershed

A storm on the east watershed that is not excessive can be contained in the dam. That is, the water storage capacity of the dam will hold up to 8½ inches of rain in six hours. If the James River is not in flood stage and a storm occurs the main gate should be left open. The dam will automatically hold back excessive flow in Mink Creek Channel. The water level in the lake will rise and the flow through the pipe will not exceed the channel capacity. In this way the houses below the dam and along the channel will be protected.

If a large storm that produces from 8½ to 14 inches of water should occur, then the maximum storage capacity of the dam would be exceeded. Then water will flow around the dam through the emergency spillway. Scottsville has had around 12 inches of water in six hours. If a large storm should occur the main gate should be left open if water can flow in Mink Creek. That is, if water can flow into the James River, let it flow don't try to hold it back.

Superstorm and Dam Safety

A superstorm would produce more than 14 inches of rain in six hours. Scottsville has never had this much rain but the

worlds record was the 1969 storm in Nelson County that produced 23½ inches of rain in eight hours.

A storm above 14 inches of rain in six hours would fill the storage capacity of the dam and also flow past the dam in the emergency spillway. The emergency spillway will handle a flow of 3000 cubic feet of water a second and the primary spillway will handle another 430 cubic feet of water a second. For this reason, any time that the water begins to flow in the emergency spillway the dam should be watched very carefully. If the emergency spillway begins to fill up the main gate should be opened if it is not already open. This would allow 3430 cubic feet of water per second to bypass the dam. Water should never flow over the top of the dam because the water could erode and cut the dam. If this were to happen the dam could release much of the water being stored with loss to property downstream and even a possible loss of life. For these reasons, when a superstorm occurs the dam should be watched constantly. When more than 16 inches of water falls in six hours, evacuation should be considered for people living along Mink Creek. The problem is that with a storm of this magnitude there is really no place to go.

The weather bureau has estimated that it is theoretically possible to get 28½ inches of rain in six hours. This estimate exceeds the worlds record by more than 50% . The following is a table of rainfalls, flows and frequency of occurance that was calculated for the Mink Creek east watershed by the engineering firm that designed the dam.

## Mink Creek East Watershed

| Rainfall in 6 hour period | Peak Flow Runoff in Cubic Ft/Sec | Average Flow c.f.s. | Average no. of years of Recurrance |
|---|---|---|---|
| 28½" | 8000 | 2874 | almost never |
| 18 " | 4500 | 1815 | 1000 |
| 14 " | 3000 | 1412 | 750 |
| 12 " | 2670 | 1210 | 600 |
| 8½" | 2000 | 851 | 500 |

### Gate Operation

The main gate of the Mink Creek dam is a 42 inch sluice gate on the impact basin at the toe of the dam.

This gate should be left in the open position except for unusual circumstances. There are two (2) times when the gate should be closed.

1. When Mink Creek Channel is full of water due to the James River flooding and the James has backed up into Mink Creek the main gate should be closed.

2. When the water in Mink Creek lake is to be used for emergency fire fighting the main gate should be closed.

### Fire Line Operation

In case it is decided to use the water in Mink Creek lake to fight a fire, it is necessary to do several things to get water into the fire hydrant which is close to the impact basin.

1. Send two or three firemen from the firehouse to Mink Creek dam with two gate cranks and one small rowboat.

2. One fireman starts right away to close the main gate.

3. At the same time the other fireman carries the boat and the other gate crank to the edge of the lake. He then rows the boat containing the gate crank to the outlet structure. He ties up the boat; puts the gate crank on the top of the structure; assends the ladder and puts the crank on the gear shaft and waits for a signal that the main gate is closed.

4. When the first fireman gets the main gate closed, he signals to the fireman on the outlet structure that the main gate is closed. This can be done through a third fireman on top of the dam or with a pair of portable radios.

5. When the signal is received at the outlet structure, the second fireman opens the lake drain gate a few inches. This fills the primary spillway pipe, the outlet structure and the fire line to the hydrant.

6. The fire hose must then be connected to the hydrant and the hydrant turned on.

The fire hydrant will supply almost ten million gallons of water and the initial pressure will be almost six pounds per square inch. During the time of a fire emergency, the main gate can be left closed without any problem.

* * *

Edward A. Mahoney
December 15, 1977

# APPENDIX VII

## SOIL AND GEOLOGICAL STUDIES
## MINK CREEK DAM

GEOLOGIST
E. O. GOOCH

SUBSURFACE EXPLORATIONS, FOUNDATIONS, EARTH DAMS, SOIL ANALYSIS,
BLAST DAMAGE, GEOLOGICAL & LAND USE STUDIES & REPORTS

ENGINEER
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CHARLOTTESVILLE, VIRGINIA

September 8, 1976

Mr. Ed Mahoney, Project Manager
Scottsville Flood Control Commission
P. O. Box 272
Scottsville, Virginia 24590

Re: Soil & Geological Studies
Mink Creek Dam
Scottsville, Virginia

Dear Mr. Mahoney:

In accordance with our proposal to you dated August 16, 1976 our firm has recently completed a series of seven soil test borings, laboratory soil tests, geological and soil studies at the referenced site. In conducting these studies we had access to a report prepared by Balzer and Associates, Geotechnics, Inc. and Richard L. Williams, dated April 8, 1976. We studied the aforementioned report, especially as it related to matters of bedrock geology, soils and engineering soil analysis.

The purpose of our study was to provide the firm of John McNair & Associates, Consulting Engineers with soil and geological information and recommendations which would assist that firm in designing a safe and economical structure at the proposed site.

Five of our soil test borings were made on or near the centerline of the proposed spillway. These borings were made (1) to determine the depth to rock and or the hardness of the soil or rock at or near the bottom of the proposed spillway and in turn whether a concrete lined spillway will be needed along the full length of the spillway, (2) to obtain samples of soil from the spillway area for laboratory testing to determine its suitability as fill material in the earth dam.

Two of our borings were made in the soft flood plain soils under the proposed embankment to determine the depth to bedrock and to obtain undisturbed soil samples for laboratory strength testing. The results of these strength tests were used in stability analysis of the proposed embankment.

The location and ground surface elevation for each of these borings was obtained by the McNair firm. The elevations are shown on our boring logs. The location of our borings will be shown on an appropriate drawing in the report to be furnished by John McNair and Associates. The boring logs, which are a part of this report, indicate the types of soil, thickness and depth of each soil layer, results of standard penetration tests, and the location of ground water and bedrock, if found.

Our firm concentrated its laboratory soil tests on the materials in the spillway area and the flood plain under the embankment. These tests consisted of compaction (AASHO T-99), permeability and undrained direct shear tests on representative samples of soil from these two locations. In order to check and correlate our test results on the soils from the spillway area with the tests made by Balzer-Geotechnics - Williams on the proposed borrow area upstream from the damsite, we ran Atterberg Limit and compaction (AASHO T-99) tests on a sample of soil from the proposed borrow site. The results of our laboratory soil tests are shown in Tables 1 and 2.

We understand that an earth dam approximately 33 feet high, with a crest at elevation 318± is planned for this site. It is to be used for flood control and will normally store water to an elevation 301± with a water depth of about 16 feet. During periods of excessive rainfall this dam will store Mink Creek waters for short periods of time (one to two weeks). These stored waters will be released as the James River drops below flood stage at Scottsville. As we understand it, the emergency spillway for this dam will only be operative during exceedingly high intensity rainfall on the watershed of Mink Creek.

GEOLOGY: We found the site underlain by phyllites that strike in a general northeasterly direction. The foliation in the phyllites generally dips to the east or southeast at about 30 degrees but because of folding both the strike and dip will vary. Exposures in the creek in the vicinity of the centerline of the dam show that the phyllites are quite fractured.

CUTOFF TRENCH: Although the rocks are quite fractured in the vicinity of the centerline of the dam, pressure tests run by Geotechnics in this area show that there is very little if any water loss through these rocks at water pressures that will be exerted on these rocks at normal pool level if the cutoff trench is taken to depths of from 7 to 12 feet below present ground surface in the stream valley. However, it may be necessary to excavate deeper than this on the abutments, especially the western abutment. For this reason we do not believe that a grout curtain will be necessary but a final decision can be made on this as the cutoff trench is excavated and inspected. Local zones of porous rock that may be uncovered may require some

grouting and an item for grouting should be included in the bid items.

Materials taken from the cutoff trench and the outlet structure excavations in the flood plain of the stream will be too wet and otherwise unsuitable for use in the embankment. It might be used to fill in the stream bed upstream of the embankment.

Provisions for pumping and keeping water out of the cutoff trench excavation during the period when backfill is being placed will need to be made.

Soil from the cutoff trench taken from the two hillsides may be incorporated in the embankment.

SPILLWAY: At the present proposed depth, the spillway will not be in hard, unweathered rock but in the weathered phyllites. However, for the most part the dip of the foliation in these rocks is opposite to the direction of water flow, thus mimimizing erosion and damage during infrequent flood flow. In our opinion this weathered rock will be resistant enough to preclude the use of a concrete liner along a good portion of its length. We believe that most of this weathered rock can be removed with heavy equipment and without blasting. We believe that heavy dozers and rippers can fashion a fairly smooth surface in much of this weathered rock.

We know of no correlation between rock hardness, as measured by the penetration test, and its ability to withstand erosion by swift moving water. However, we believe that it will withstand infrequent velocities of 30-40 ft/sec and perhaps as high as 60 ft/sec without serious damage.

Soils taken from the spillway area can be used in the embankment. The weathered rock taken from the spillway can be used in the downstream side of the embankment.

We suggest that the downstream side of the spillway bottom be sloped slightly outboard from the embankment so that any erosion of sides and bottom will be primarily into the hillside rather than towards the embankment.

EMBANKMENT: We recommend that approximately one foot of topsoil with roots etc. be stripped from under the proposed embankment. In some of the areas of the floodplain it may be necessary to remove a little more than one foot while on the hillsides less than one foot may be satisfactory.

An unzoned or homogeneous embankment can be built upon this site. Soils (excluding topsoil) from the proposed spillway area and the upstream

borrow areas are suitable for use in the embankment. These soils should be compacted in 6-8 inch layers (loose lift) to dry unit weights no less than 95% of AASHO T-99 compaction and within ± 4% of optimum moisture content.

We made a stability analysis of an embankment with the following characteristics at this site:

1. Top width 15 feet.
2. Slopes 3:1 upstream & 2 1/2:1 downstream.
3. Height of dam 33 ft.
4. Floodplain soil $\phi = 35^{o}$ & c=o.
5. Embankment soil $\phi = 24^{o}$ & c=1000 #/ft$^2$.
6. Mass unit weight of soils = 120 lb/ft$^3$.

The downstream side was deemed critical and the rapid drawdown condition on the upstream face was not considered since the full reservoir condition will only exist for a short time (a few days). Soil strength data were obtained from our direct shear tests.

Thirty five trial failure surfaces through the embankment and the underlying flood plain soils were studied. A copy of the computer print out sheet showing the factor of safety (FS) is enclosed. The minimum factor of safety obtained was 2.64. This should be adequate for this embankment. Moreover, it indicates that it will not be necessary to remove all of the flood plain soil to bedrock.

The need for rip rap on the upstream side has been raised. We can not answer this question with certainty. In our opinion it will not be required for the full reservoir condition. The upstream slope from high water to about normal pool can be planted to grass and other vegetation. Rip rap from a few feet above normal pool stage to a few feet below should be considered, however, for protection from burrowing animals.

Rock observed at the site were not deemed suitable for rip rap.

We did not drill into the proposed borrow area upstream of the dam since the Geotechnics firm had explored it extensively. It would appear from their studies that soil averaging about 5-6 feet may be available for the embankment.

CONCLUSIONS: We recommend that slopes of 3:1 & 21/2:1 be used rather than the 3 1/2:1 and 2 1/2:1 slopes proposed by the former consultants. We do not

believe that a grout curtain will be needed under the dam. We suggest that a bid item for grouting be included and that the cutoff trench be examined by a geologist and engineer as it is being excavated to assure that porous rock has been removed. If local grouting is needed it can be called for at that time.

In our opinion it will not be necessary to remove all of the flood plain soil from under the embankment. This will represent a saving also.

In our opinion it may not be necessary to use a concrete lined spillway section over much of the length of the spillway. The firm of John McNair and Associates will need to make the final decision on this, however, in order to satisfy both hydraulic and erosional requirements.

It has been a pleasure serving you on this project. Please call if there are any questions.

Very truly yours,

E. O. GOOCH & ASSOCIATES

E. O. Gooch, Geologist

H. G. Larew, P. E.

Encls.

COMMONWEALTH OF VIRGINIA
H. GORDON LAREW
No.
1990
CERTIFIED PROFESSIONAL ENGINEER

TABLE I - LABORATORY SOIL TEST RESULTS

| Sample No. | Location & Depth | Soil Type | Liquid Limit (%) | Plastic Limit (%) | PI (%) | Opt. Moisture Content AASHOT-99 (%) | Opt. Dry Unit Weight #/ft$^3$ | Permeability cm/sec | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | At or near opt. water content | 3-4% Dry of opt. water content |
| 1 | Spillway Sta 0+65, 1+10 & 1+60. Upper 8-10 ft. | Rad to Brown Sandy Silt | -- | -- | -- | 21.9 | 103.9 | $1.16 \times 10^{-6}$ | $4.01 \times 10^{-7}$ |
| 2 | Spillway Sta 0+60, 1+10 & 1+65. Below 8-10 ft. | Red to Brown Sandy Silt | -- | -- | - - | 18.0 | 107.5 | $3.58 \times 10^{-6}$ | $2.13 \times 10^{-6}$ |
| 3 | Proposed Borrow Area Near P-9 | Tan-Red Micaceous Clayey Silt | 46.4 | 33.1 | 13.3 | 24.0 | 96.6 | ---- | --- |

## TABLE II - LABORATORY TEST RESULTS - DIRECT SHEAR

| Sample No. | Location and Depth | Soil Description | Cohesion C ($\#/ft^2$) | Angle of Internal friction ($\phi$) | Percent Strain | Comments |
|---|---|---|---|---|---|---|
| 0 | Boring No. 7 2 ft. depth | Natural Soil Gray Silty Sand with Gravel | 0 | $35^0$ | 6% | |
| 1 | Spillway. Sta 0+65, 1+10 & 1+60 Upper 8-10 ft. | Red to Brown Sandy Silt | 1100 | $24^0$ | 5%+ | Compacted at opt water content and opt dry unit weight |
| 2 | Spillway. Sta 0+65, 1+10 & 1+60. Below 8-10 ft. | Rod to Brown Sandy Silt | 1200 | $26^0$ | 6%+ | Compacted at opt water content and opt dry unit weight |

| YT | RT | FS |
|---|---|---|
| 400.00 | 115 | 4.97 |
| 400.00 | 120 | 2.95 |
| 380.00 | 95 | 5.75 |
| 380.00 | 100 | 3.13 |
| 360.00 | 75 | 6.73 |
| 360.00 | 80 | 3.33 |
| 340.00 | 55 | 8.55 |
| 340.00 | 60 | 3.59 |
| 400.00 | 110 | 4.52 |
| 400.00 | 115 | 3.82 |
| 400.00 | 120 | 2.75 |
| 380.00 | 90 | 4.73 |
| 380.00 | 95 | 3.79 |
| 380.00 | 100 | 2.64 ← |
| 360.00 | 70 | 5.42 |
| 360.00 | 75 | 4.03 |
| 360.00 | 80 | 2.64 ← |
| 340.00 | 50 | 6.47 |
| 340.00 | 55 | 4.59 |
| 340.00 | 60 | 2.81 |
| 400.00 | 100 | 6.36 |
| 400.00 | 105 | 5.09 |
| 400.00 | 110 | 4.60 |
| 400.00 | 115 | 4.35 |
| 400.00 | 120 | 3.59 |
| 380.00 | 80 | 6.36 |
| 380.00 | 85 | 4.90 |
| 380.00 | 90 | 4.27 |
| 380.00 | 95 | 4.03 |
| 380.00 | 100 | 3.32 |
| 360.00 | 60 | 6.83 |
| 360.00 | 65 | 4.82 |
| 360.00 | 70 | 4.12 |
| 360.00 | 75 | 3.78 |
| 360.00 | 80 | 3.11 |

E. O. GOOCH & ASSOCIATES
Geologists and Engineers
Charlottesville Culpeper

# EXPLANATION OF TEST HOLE LOGGING SYMBOLS AND TERMS

## Hole Identification

DH - Drill Hole, logging based on examination of samples
DP - Drill Probe, logging based on observation of penetration and cuttings only
TP - Test Pit
HA - Hand Auger Hole
EP - Exposed Profile, bank or cut

Example: DH 104 (Type / Number)

## Sample Identification

SS - Split Spoon Sample, unless otherwise noted sample obtained in accordance with ASTM D-1586, 2" O.D. sampler, 140 lb. hammer, 30" drop, blows counted for three consecutive increments of 0.5 ft.

DS - Disturbed Sample, bag or jar
US - Undisturbed Sample, Shelby Tube or hand cut
RC - Rock Core

Example: DS-106-3 (Type / Hole / Sequence)

## Unified Soil Classification System

GW - Clean gravel, wide range of sizes
GP - Clean gravel, narrow range of sizes
SW - Clean sand, wide range of sizes
SP - Clean sand, narrow range of sizes
GC - Gravel with clay fines
GM - Gravel with silt fines
SC - Sand with clay fines
SM - Sand with silt fines
CL - Clay, low Liquid Limit
CH - Clay, high Liquid Limit
ML - Silt, low Liquid Limit
MH - Silt, high Liquid Limit

Parentheses with symbol indicates classification by visual-manual methods.

Size Classification:

Boulder - over 12"
Cobbles - 3" to 12"
Gravels - #4 sieve to 3"
Sands - #200 sieve to #4 sieve
Clays and Silts - Finer than #200 Sieve

TEST HOLE LOG

E. O. GOOCH & ASSOCIATES, GEOLOGISTS AND ENGINEERS

CHARLOTTESVILLE CULPEPER

Project Mink Creek Dam Hole B13 Sheet 1 of 1 Date 8/17/76

Location See Boring Plan Surf. Elev. ___ Depth 2.5 Logged by SPG

Ground Water Data: Caved in and dry to 2.2 ft. 24 hrs after completion

| Elev. | Depth | Material Description | Sampling Data | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sample | From | To | Blows | Rec. |
| | 0.0 | Topsoil | | | | | |
| | 1.0 | Brown coarse to fine sand with gravel size pieces of quartz and phyllite (SW) | SS B13-1 | 2.0 | 2.5 | 10* | 0.5 |
| | 2.5 | Hole terminated at 2.5 ft. with hand auger refusal | | | | | |
| | | *blow count influenced by gravel in sampler | | | | | |

TEST HOLE LOG
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CHARLOTTESVILLE CULPEPER

Project Mink Creek Dam Hole B14 Sheet 1 of 1 Date 8/17/76

Location See Poring Plan Surf. Elev. ____ Depth 5.5 Logged by SPG

Ground Water Data: Water 4.2 ft. below surface 24 hrs after completion

| Elev. | Depth | Material Description | Sampling Data | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sample | From | To | Blows | Rec. |
| | 0.0 | Topsoil | | | | | |
| | 1.0 | Brown to gray silty sand. (SM). | SS B14-1 | 2.0 | 2.5 | 6 | |
| | | | | 2.5 | 3.0 | 6 | 1.0 |
| | 3.5 | Brown coarse to fine sand with gravel (SW) | SS B14-2 | 4.0 | 4.5 | 2 | |
| | 4.8 | | | 4.5 | 5.0 | 6 | 1.0 |
| | | Weathered phyllite | | | | | |
| | 5.5 | Hole terminated at 5.5 ft. with hand auger refusal. | | | | | |

TEST HOLE LOG
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CHARLOTTESVILLE CULPEPER

Project Mink Creek Dam Hole B15 Sheet 1 of 1 Date 8/18/76

Location Spillway: Sta 0+65 Surf. Elev. _____ Depth 14.2 Logged by SPG

Ground Water Data: Dry 8 days after completion

| Elev. | Depth | Material Description | Sampling Data | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sample | From | To | Blows | Rec. |
| | 0.0 | Topsoil | | | | | |
| | 1.0 | Red to brown sandy silt. (ML). Weathered phyllite | | | | | |
| | | | SS B15-1 | 3.5 | 4.0 | 15 | |
| | | | | 4.0 | 4.5 | 20 | 1.0 |
| | | | | 4.5 | 5.0 | 20 | |
| | | | SS B15-2 | 8.5 | 9.0 | 14 | |
| | | | | 9.0 | 9.5 | 30 | 1.0 |
| | | | | 9.5 | 9.7 | 20 | |
| | | | SS B15-3 | 13.5 | 14.0 | 28 | |
| | | | | 14.0 | 14.2 | 22 | 0.7 |
| | 14.2 | Hole terminated at 14.2 ft. | | | | | |

TEST HOLE LOG
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CHARLOTTESVILLE CULPEPER

Project Mink Creek Dam Hole B16 Sheet 1 of 1 Date 8/18/76

Location Spillway: Sta 1+10 Surf. Elev. ____ Depth 19.1 Logged by SPG

Ground Water Data: Dry 8 days after completion

| Elev. | Depth | Material Description | Sampling Data | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sample | From | To | Blows | Rec. |
| | 0.0 | Topsoil | | | | | |
| | 1.0 | Red to brown sandy silt. (ML). | | | | | |
| | | Weathered phyllite | SS B16-1 | 3.5 | 4.0 | 15 | |
| | | | | 4.0 | 4.5 | 15 | 1.5 |
| | | | | 4.5 | 5.0 | 25 | |
| | | | SS B16-2 | 8.5 | 9.0 | 14 | |
| | | | | 9.0 | 9.5 | 19 | 1.5 |
| | | | | 9.5 | 10.0 | 21 | |
| | | | SS B16-3 | 13.5 | 14.0 | 27 | |
| | | | | 14.0 | 14.3 | 23 | 0.8 |
| | | | SS B16-4 | 18.5 | 19.1 | 50 | 0.6 |
| | 19.1 | Hole terminated at 19.1 ft. | | | | | |

TEST HOLE LOG
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CHARLOTTESVILLE CULPEPER

Project Mink Creek Dam Hole B17 Sheet 1 of 2 Date 8/18/76

Location Spillway: Sta 1+60 Surf. Elev. ____ Depth 23.9 Logged by SPG

Ground Water Data: Dry 8 days after completion

| Elev. | Depth | Material Description | Sampling Data | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sample | From | To | Blows | Rec. |
| | 0.0 | | | | | | |
| | 1.0 | Topsoil | | | | | |
| | | Red to brown sandy silt. (ML). Weathered phyllite. | | | | | |
| | | | SS B17-1 | 3.5 | 4.0 | 19 | |
| | | | | 4.0 | 4.5 | 24 | 1.5 |
| | | | | 4.5 | 5.0 | 26 | |
| | | | SS B17-2 | 8.5 | 9.0 | 14 | |
| | | | | 9.0 | 9.5 | 21 | 1.5 |
| | | | | 9.5 | 10.0 | 31 | |
| | | | SS B17-3 | 13.5 | 14.0 | 34 | |
| | | | | 14.0 | 14.2 | 16 | 0.7 |
| | | | SS B17-4 | 18.5 | 19.0 | 34 | |
| | | | | 19.0 | 19.1 | 16 | 0.6 |
| | 20.0 | cont on sheet 2 of 2 | | | | | |

TEST HOLE LOG

E. O. GOOCH & ASSOCIATES, GEOLOGISTS AND ENGINEERS

CHARLOTTESVILLE CULPEPER

Project Mink Creek Dam Hole B17 Sheet 2 of 2 Date 8/18/76

Location Spillway: Sta 1+60 Surf. Elev. ____ Depth 23.9 Logged by SPG

Ground Water Data: Dry 8 days after completion

| Elev. | Depth 20.0 | Material Description cont from sheet 1 of 2 | Sampling Data | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sample | From | To | Blows | Rec. |
| | | Red to brown sandy silt. (ML). Weathered phyllite | | | | | |
| | 23.9 | Hole terminated at 23.9 ft. | SS B17-5 | 23.5 | 23.9 | 50 | 0.4 |

TEST HOLE LOG
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CHARLOTTESVILLE CULPEPER

Project Mink Creek Dam Hole B18 Sheet 1 of 1 Date 8/18/76

Location Spillway: Sta 2+35 Surf. Elev. ____ Depth 13.8 Logged by SPG

Ground Water Data: Dry 8 days after completion

| Elev. | Depth | Material Description | Sampling Data | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sample | From | To | Blows | Rec. |
| | 0.0 | Topsoil | | | | | |
| | 1.0 | Yellow to brown sandy silt. (ML). Weathered phyllite | SS B18-1 | 3.5 | 4.0 | 14 | |
| | | | | 4.0 | 4.6 | 50 | 1.1 |
| | | | SS B18-2 | 8.5 | 9.0 | 50 | 0.5 |
| | 13.8 | Hole terminated at 13.8 ft. | SS B18-3 | 13.5 | 13.8 | 50 | 0.3 |

TEST HOLE LOG

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CHARLOTTESVILLE CULPEPER

Project Mink Creek Dam Hole B19 Sheet 1 of 1 Date 8/18/76

Location Spillway: Sta 3+00 Surf. Elev. ____ Depth 1.0 Logged by SPG

Ground Water Data: Dry 8 days after completion

| Elev. | Depth | Material Description | Sampling Data | | | | |
|---|---|---|---|---|---|---|---|
| | | | Sample | From | To | Blows | Rec. |
| | 0.0 | | | | | | |
| | 1.0 | Weathered phyllite<br>Hole terminated at 1.0 ft. | | | | | |

Geological Information Extracted From

"MINK CREEK DAM AND RESERVOIR
REPORT AND PRELIMINARY ENGINEERING"

Dated: April 8, 1976

Prepared by:

Balzer & Associates
Geotechnics, Inc.
Richard L. Williams, P. E.

MINE CREEK DAM AND RESERVOIR SCOTTSVILLE, VA.

## SUMMARY OF TEST RESULTS

| BORING OR TEST PIT NO. | SAMPLE NO. | DEPTH FT | MOISTURE-DENSITY RELATIONS ASTM D-1557 MAX DENSITY PCF | MOISTURE-DENSITY RELATIONS ASTM D-1557 OPT MOISTURE % | % GRAVEL | % SAND | % SILT-CLAY | LL | PI | NATURAL MOISTURE CONTENT % | PERMEABILITY cm/sec | CLASS (USCS) | REMARKS REMARKS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| P-1 | | 2.5 | 105.1 | 19.6 | 1 | 19 | 80 | 62 | 11 | 30.7 | $2.4 \times 10^{-6}$ | MH | |
| P-4 | | 2.5 | 119.9 | 12.4 | 4 | 55 | 41 | 32 | 8 | 18.8 | | SM | |
| P-5 | | 2.5 | 108.7 | 14.8 | 0 | 60 | 40 | 37 | 3 | 28.9 | | SM | |
| TP-13 | BS-5 | 6.0 | 122.1 | 11.0 | 17 | 58 | 25 | 31 | 2 | | $6.1 \times 10^{-6}$ | SM | |
| TP-22 | BS-6 | 6.0 | 104.3 | 18.8 | 0 | 53 | 47 | 41 | NP | 28.7 | | SM | |
| TP-1 | | 5.0 | | | | | | | | 19.0 | | | |
| TP-2 | | 2.5 | | | | | | | | 37.9 | | | |
| TP-2 | | 3.5 | | | 54 | 33 | 13 | 42 | 9 | | | GM | TYPICAL OF ROCKY MTL. @ BOTTOM OF BORROW |
| TP-5 | | 3.5 | | | | | | | | 30.8 | | | |
| TP-11 | | 2.0 | | | | | | | | 18.6 | | | |
| TP-11 | | 4.0 | | | 21 | 67 | 12 | 25 | 5 | | | SC-SM | TYPICAL OF ROCKY MTL. @ BOTTOM OF BORROW |
| TP-13 | | 3.5 | | | | | | | | 22.4 | | | |
| UPPER FIELD S-1 | | | | | | | | 36 | 15 | 20.3 | | | BUCKINGHAM COUNTY POSSIBLE BORROW |
| CONTACT ZONE S-2 | | | | | | | | 52 | 14 | 21.8 | | | " |
| SLOPE SEDIMENTE RTE 20 S-3 | | | | | | | | | | 19.1 | | | " |
| FLOOD PLAIN S-4 | | | | | | | | | | 33.1 | | | " |
| RTE 6 & E. SIDE INT. | | | | | | | | | | 15.3 | | | ALBEMARLE CO. POSSIBLE BORROW |
| 6 | 1 | 1.5-2.5 | | | 0 | 34 | 66 | 29 | 3 | 22.9 | | ML | ALLUVIUM FROM NEAR E DAM |
| 12 | 1 | 1.5-2.5 | | | 8 | 69 | 23 | 23 | 1 | 21.1 | | SM | " |

VII-13

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure OAM | Sheet 1 of 3

Geologist S.G.W. | Boring No. 1

Contractor C.C.D. | Engineer — | Date 22 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 69.7' |
| | | | | | | | Rock 61.4' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 308.8 |
| 326.1 | 0.0 | | | | | | REMARKS |
| | | | RESIDUUM. | | | | Hole cased 22.0' |
| | | | Red to reddish-tan, micaceous | 10 | 1' | (1) | Sample 1.5'-2.5' |
| | | | clayey SILT to silty CLAY w/ | | | | Drill water red. |
| | | | scattered rock fragments and | | | | |
| | | | traces organics. | | | | |
| | | | Increase in rock fragments. | 25 | 0.5' | (2) | Sample 5.0'-5.5' |
| | | | | | | | Core barrel in. |
| | | | | | | | Drill water greenish-tan |
| 317.8 | 8.3 | | TOP OF WEATHERED ROCK. | | | | @ 8.3' w/scattered brown |
| 316.1 | 10.0 | | Greenish-tan, highly weathered, | | | | zones. |
| | | | badly broken GREENSTONE w/ | | | | Core Rec. 5.5'-11.4' |
| | | | iron stained partings and | | | | 36% |
| | | | scattered clayey seams. Few | | | | |
| | | | quartz veins. | | | | Drill water greenish-tan |
| | | | | | | | again @ 11.4'; alternating |
| | | | Alternating hard and soft zones. | | | | brown water. |
| | | | | | | | |
| | | | | | | | Drilling rate 11.4'-21.2' |
| 306.1 | 20.0 | | | | | | 1'/min. to 1'/1.5 min. |
| | | | | | | | Core Rec. 11.4'-21.2' |
| | | | | | | | 11% |
| | | | | | | | Harder @ approx. 23.2' |
| | | | | | | | Drilling rate 25.2'-26.2' |
| | | | | | | | 1'/3.5 min. |
| | | | | | | | Greenstone is chlorite- |
| | | | | | | | actinolite SCHIST. |
| 296.1 | 30.0 | | | | | | |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 2 of 3

Geologist S.G.W. | Boring No. 1

Contractor C.C.D. | Engineer —— | Date 22 DEC. 1975

| Stratification Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Lnth of hole 69.7' |
| | | | | | | | Rock 61.4' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 308.8 |
| 296.1 | 30.0 | | | | | | REMARKS |
| | | | Green to greenish-tan, partially to highly weathered, moderately to badly broken GREENSTONE w/iron stained partings and few quartz veins. Includes few sandy zones and clayey seams. | | | | Core Rec. 21.2'-31.2' 28% |
| | | | | | | | Foliation dips approx. 25°-30°. |
| 291.4 | 34.7 | | | | | | Harder @ 32.0'. Drill water milky gray to milky green. |
| | | | TOP OF ROCK. Green, slightly to partially weathered, slightly to moderately broken GREENSTONE w/scattered quartz veins. | | | | Core blocking 31.2'-63.2'. |
| 286.1 | 40.0 | | | | | | Short pulls. Core Rec. 31.2'-39.5' 96% |
| | | | | | | | Foliation dips approx. 10°-20° w/local steepening. |
| | | | Moderately to badly broken 44.5'-46.5' | | | | Core Rec. 39.5'-46.5' 94% |
| | | | Badly broken 46.5'-48.3'. | | | | Core broken along foliation planes in pieces 0.05'-0.5' thick. |
| 276.1 | 60.0 | | | | | | Drilling rate 48.5'-50.5' 1'/3.5 min. |
| | | | Moderately to badly broken 52.8'-56.9' w/scattered quartz masses. | | | | Core Rec. 46.6'-52.8' 91% |
| | | | | | | | Core Rec. 52.8'-56.9' 85% |
| 266.1 | 60.0 | | | | | | |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 3 of 3

Geologist S.G.W. | Boring No. 1

Contractor C.C.D. | Engineer —— | Date 22 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 69.7' |
| | | | | | | | Rock 61.4' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 308.8 |
| 256.1 | 60.0 | | | | | | REMARKS |
| | | | Green, slightly weathered, slightly to moderately broken | | | | Drilling rate 60.2'-61.2' 1'/6 min. |
| | | | GREENSTONE w/ scattered quartz veins. | | | | Core Rec. 56.9'-63.2' 97% |
| | | | Badly broken @ 57.0'; 57.9'-58.2'; 59.6'-59.8'. | | | | Quartz masses 60.2'-61.2'. Foliation dips approx. 20°-25° |
| | | | | | | | Drilling rate 61.7'-68.7' 1'/3.5 min. |
| 256.4 | 69.7 | | BOTTOM OF HOLE. | | | | Core Rec. 63.2'-69.7' 98% |
| | | | Completed 4:10 P.M. 22 Dec. 1975 | | | | Core is less broken. |
| | | | | | | | W.L. @ completion - 17.0' (Casing in) |
| | | | | | | | W.L. 4:25 P.M. 23 Dec. 1975 - 17.3' |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 1

## PRESSURE TESTING

| Depth (ft.)* | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 32.0'-37.0' | 10 | 8 |
| | 20 | 13.5 |
| | 30 | 21.5 |
| | 40 | 29 |
| | 30 | 21 |
| | 20 | 14.5 |
| | 10 | 16 |
| 37.0'-69.7' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |

* Note: All depths measured from ground surface

Depth 26.4'-31.4': Packers would not seat

AD-A073 626 BAKER (MICHAEL) JR INC BEAVER PA F/G 13/2
NATIONAL DAM SAFETY PROGRAM. MINK CREEK DAM (ID NUMBER VA-00352--ETC(U)
FEB 79 M BAKER DACW65-78-D-0016
UNCLASSIFIED NL

2 OF 2
AD
A073626

END
DATE FILMED
10-79
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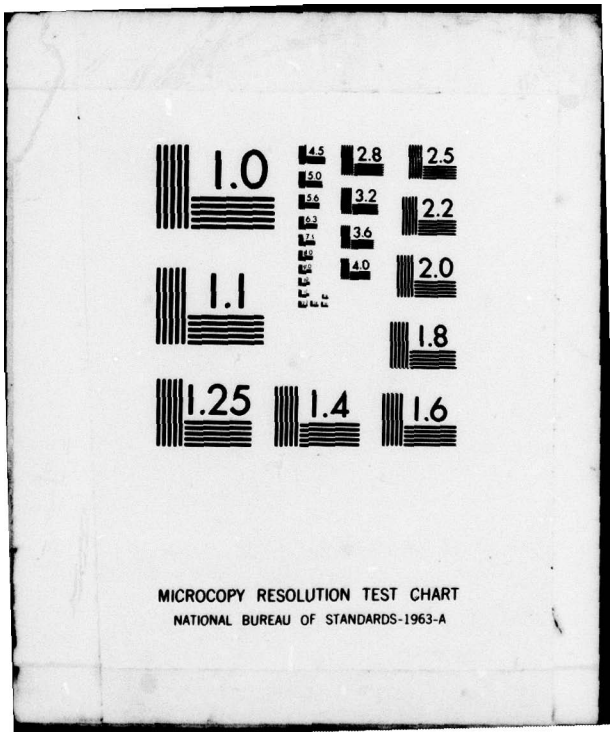
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0
4.5
5.0
5.6
6.3
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Location MINK CREEK SCOTTSVILLE, VA. BORING LOG Comm. No. 1176

Structure DAM Sheet 1 of 3

Geologist S.G.W Boring No. 2

Contractor C.C.D. Engineer — Date 18 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 68.2' |
| | | | | | | | Rock 48.6' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water — |
| 322.4 | 0.0 | | | | | | REMARKS |
| | | | RESIDUUM. | | | | Hole cased 12.0' |
| | | | Mottled red and tan, micaceous | 17 | 1' | (1) | Sample 1.5'-2.5' |
| | | | clayey SILT to silty CLAY w/rock | | | | Drill water red to 5.0', |
| | | | fragments and traces of organics. | | | | then reddish-tan to tan. |
| 317.4 | 5.0 | | Green to greenish-tan, micaceous | 25 | 0.5' | (2) | Sample 5.0'-5.5' |
| | | | clayey SILT w/red mottling and | | | | |
| | | | rock fragments. Decomposed | | | | Drill water tan @ 7.8'. |
| 312.4 | 10.0 | | greenstone. | | | | |
| | | | | 25 | 0.4' | (3) | Sample 10.0'-10.4' |
| | | | | | | | |
| | | | | | | | Slightly harder @ 14.1' |
| | | | | | | | |
| 302.8 | 19.6 | | | | | | |
| 302.4 | 20.0 | | TOP OF WEATHERED ROCK. | | | | Drill water greenish-tan |
| | | | Green to greenish-tan, highly | | | | @ 19.6' w/thin brown zones. |
| | | | weathered, badly broken | | | | Core Rec. 12.0'-22.0' |
| | | | GREENSTONE w/scattered | | | | 23% |
| | | | quartz veins and iron stained | | | | Greenstone is chlorite- |
| | | | partings. Includes scattered | | | | actinolite SCHIST. |
| | | | sandy zone. and occasional | | | | Drill water briefly red @ |
| | | | clayey seams. | | | | 26.2'. |
| | | | | | | | Drill water milky green @ |
| 292.4 | 30.0 | | VII-24 | | | | 29.2', followed by alter- |
| | | | | | | | nating tan and brown |
| | | | | | | | water. |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 2 of 3

Geologist S.G.W. | Boring No. 2

Contractor C.C.D. | Engineer — | Date 18 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 68.2' |
| | | | | | | | Rock 48.6' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water — |
| 292.4 | 30.0 | | | | | | REMARKS |
| | | | Green to greenish-tan, highly weathered, badly broken GREENSTONE w/scattered quartz veins and iron stained partings. Includes scattered sandy zones and occasional clayey seams. TOP OF ROCK. | | | | Core blocked. Core Rec. 22.0'-31.2' 52% Drill water milky gray to milky green @ 31.8'. Drilling rate 33.2'-34.2' 1'/2.6 min. Core blocked. |
| 289.9 | 32.5 | | | | | | |
| | | | | | | | |
| | | | Green, slightly to partially weathered, partially to moderately broken GREENSTONE w/scattered quartz veins. | | | | Core Rec. 31.2'-35.0' 80% Stopped @ 5:00 P.M. |
| 282.4 | 40.0 | | | | | | |
| | | | | | | | Traces of pyrite, chalcopyrite and epidote. |
| | | | Badly broken to 36.0' then moderately broken to 38.1' | | | | Core Rec. 35.0'-45.2' 99% Core broken along foliation planes in pieces 0.05'-0.7' thick. Foliation dips approx 10°-30° w/local steepening. |
| | | | | | | | |
| 272.4 | 50.0 | | Badly broken 43.9'-46.2'; 49.4'-51.4'; 52.9'-55.4'. | | | | Core blocked 51.4'-53.1'. Short pulls. Core Rec. 46.2'-51.4' 94% Core Rec. 51.4'-56.4' 99% Drilling rate 58.4'-59.4' 1'/4 min. |
| | | | | | | | |
| | | | | | | | |
| 262.4 | 60.0 | | | | | | |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 3 of 3

Geologist S.G.W | Boring No. 2

Contractor C.C.O. | Engineer — | Date 19 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 68.2' |
| | | | | | | | Rock 48.6' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water — |
| 262.4 | 63.0 | | | | | | REMARKS |
| | | | Green, slightly to partially weathered, partially to moderately broken GREENSTONE w/scattered quartz veins. | | | | Core Rec. 55.4'-60.7' 92% |
| | | | | | | | Core Rec. 60.7'-63.1' 98% |
| | | | Badly broken 58.2'-60.7', 66.0'-66.5' | | | | |
| | | | | | | | Core Rec. 63.1'-68.2' 99%+ |
| 254.2 | 68.2 | | BOTTOM OF HOLE. Completed 12:08 P.M. 19 Dec. 1975 | | | | Quartz masses 66.9'-68.2'. Picked up additional 0.2' of core. Probably part of 0.4' core loss from 55.4'-60.7'. Core Rec. then is 96%. |
| | | | | | | | W.L. @ completion - 14.4'. |
| | | | | | | | W.L. 7:10 A.M. 22 Dec. 1975- collapsed and dry @ 14.5'. |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 2

PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 25.0'-30.0' | 10 | 16 |
| | 20 | 21.5 |
| | 30 | 39 |
| | 40 | 38.5 |
| | 30 | 33.5 |
| | 20 | 29.5 |
| | 10 | 24.5 |
| 30.0'-35.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0.5 |
| | 40 | 0 |
| | 30 | 0.5 |
| | 20 | 0.5 |
| | 10 | 0 |
| 35.0'-68.2' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 1 of 3

Geologist S.G.W. | Boring No. 3

Contractor C.C.D. | Engineer —— | Date 17 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 72.0' |
| | | | | | | | Rock 64.6' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 294.8 |
| 315.7 | 0.0 | | | | | | REMARKS |
| | | ~ı~ • • ı~ı | RESIDUUM. Green, micaceous clayey SILT w/ | 12 | 1' | (1) | Hole cased 22.0'. Sample 1.5'-2.5' |
| | | ~ı~ • ı~ı | red mottling and traces organics. Decomposed greenstone. | | | | Harder @ 3.0'. Drill water alternating |
| | | ~ı~ • ı~ı | Mottled greenish-grey, tan and red. | 50 | 0.9' | (2) | red to tan. Sample 5.0'-5.9' |
| 308.3 | 7.4 | ~ı~ • ı~ı | TOP OF WEATHERED ROCK. | | | | Root in sample. |
| 305.7 | 10.0 | | | | | | Drill water greenish-tan to tan @ 7.4'. |
| | | | Green, highly weathered, badly | | | | Drilling rate 7.0'-10.0' 1'/0.75 min. |
| | | | broken GREENSTONE w/iron | | | | Core Rec. 6.0'-11.2' 69% |
| | | | stained partings and few quartz | | | | |
| | | | veins. Includes scattered sandy | | | | |
| | | | zones and occasional clayey partings. | | | | Greenstone is chlorite |
| | | | | | | | actinolite SCHIST. |
| 295.7 | 20.0 | | | | | | |
| | | | | | | | Core Rec. 11.2'-21.4' 39% |
| | | | | | | | Much of core washed away. |
| | | | | | | | |
| | | | | | | | |
| 285.7 | 30.0 | | VII-28 | | | | Harder @ 28.5'. |
| | | | | | | | |

Location MINK CREEK SCOTTSVILLE, VA.

BORING LOG

Structure DAM

Geologist S.G.W

Engineer —

Contractor C.C.D.

Comm. No. 1176

Sheet 2 of 3

Boring No. 3

Date 17 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 72.0' |
| 235.7 | 33.0 | | | | | | Rock 64.6' |
| | | | Green, highly weathered, moderately | | | | Wt of hammer 140# |
| | | | to badly broken GREENSTONE | | | | Av fall of ham 30" |
| | | | w/few quartz veins and iron | | | | El of grd. water 294.8 |
| | | | stained partings. Includes few | | | | Core blocking 30.0'-42.2'. |
| | | | sandy zones. | | | | Short pulls. |
| | | | | | | | Core Rec. 21.4'-30.0' |
| | | | | | | | 65% |
| | | | | | | | Core Rec. 30.0'-35.2' |
| 219.4 | 36.3 | | TOP OF ROCK. | | | | 77% |
| | | | Green, slightly to partially | | | | Drill water green, milky |
| | | | weathered, partially to moderately | | | | green to milky gray |
| 215.7 | 40.0 | | broken GREENSTONE w/scattered | | | | below 36.2'. |
| | | | quartz veins. | | | | Foliation dips approx. 25° |
| | | | | | | | w/local steepening. |
| | | | | | | | Core Rec. 35.2'-42.2' |
| | | | | | | | 97% |
| | | | Badly broken 36.8'-37.3'. | | | | Core broken along foliation |
| | | | | | | | planes in pieces 0.05'- |
| | | | Numerous thin quartz veins and | | | | 0.5' thick. |
| | | | masses 42.3'-49.1'. | | | | |
| | | | | | | | Drilling rate 48.2'-49.2' |
| 265.7 | 50.0 | | Clayey seam 49.1'-50.0'. | | | | 1'/3.5 min. |
| | | | | | | | Core Rec. 42.2'-51.7' |
| | | | | | | | 91% |
| | | | | | | | Core loss apparently in |
| | | | | | | | clayey seam. |
| | | | | | | | Foliation dips approx. |
| | | | | | | | 10°. |
| | | | | | | | |
| 255.7 | 60.0 | | | | | | |
| | | | | | | | |

Location MINK CREEK SCOTTSVILLE, VA. BORING LOG Structure DAM Comm. No. 1176
Sheet 3 of 3
Geologist S.G.W. Boring No. 3
Contractor C.C.O. Engineer —— Date 17 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Lnth of hole 72.0' |
| | | | | | | | Rock 64.6' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 294.8 |
| Elevation | Depth | Legend | | Blows | Penetration | | REMARKS |
| 255.7 | 60.0 | | | | | | |
| | | | Green, slightly to partially weathered, partially to moderately broken | | | | Drilling rate 59.7'-60.7' 1'/3.5 min. |
| | | | GREENSTONE w/scattered quartz veins. | | | | Core Rec. 61.7'-61.7' 78% |
| | | | Badly broken @ 64.8' and 69.2'. | | | | Lost 2.2' of core - fell out of core barrel when pulled. Cored to 62.0'. Could not pick up lost core. |
| 245.7 | 70.0 | | | | | | Core Rec. 61.7'-62.0' 99%+ |
| 243.7 | 72.0 | | | | | | Quartz veins. |
| | | | BOTTOM OF HOLE. Completed 7:50 A.M. 18 Dec. 1975 | | | | Drilling rate 65.0'-66.0' 1'/5 min. |
| | | | | | | | Stopped @ 5:46 P.M. - 67.1'. |
| | | | | | | | Core Rec. 62.0'-72.0' 99% |
| | | | | | | | Foliation dips approx. 10° 20° w/local steepening. |
| | | | | | | | W.L. @ completion - 21.2'. |
| | | | | | | | |
| | | | | | | | Water pressure tests indicate fractured zone |
| | | | | | | | between 60.5'-61.0'. |
| | | | VII-30 | | | | W.L. 12:10 P.M. 19 Dec. 1975- 20.9'. |
| | | | | | | | |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 3

PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 32.0'-37.0' | 10 | 0.5 |
| | 20 | 1 |
| | 30 | 1 |
| | 40 | 6 |
| | 30 | 6.5 |
| | 20 | 3.5 |
| | 10 | 2 |
| 37.0'-72.0' | 10 | 5.5 |
| | 20 | 5 |
| | 30 | 7.5 |
| | 40 | 7.5 |
| | 30 | 4 |
| | 20 | 4.5 |
| | 10 | 8.5 |
| 41.0'-72.0' | 10 | 4.5 |
| | 20 | 5.5 |
| | 30 | 11 |
| | 40 | 3.5 |
| | 30 | 5.5 |
| | 20 | 4.5 |
| | 10 | 2 |
| 51.0'-72.0' | 10 | 5 |
| | 20 | 5.5 |
| | 30 | 8.5 |
| | 40 | 7.5 |



cont.

Test Boring No. 3 page 2

| Depth (ft) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 56.0'-72.0 | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 11 |
| | 30 | 6.5 |
| | 20 | 5.5 |
| | 10 | 2 |
| 61.0'-72.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0.4 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |
| 46.0'-51.0' | 10 | 0 |
| | 20 | 0.5 |
| | 30 | 0 |
| | 40 | 0 |
| 51.0'-56.0' | 40 | 0 |
| 56.0'-61.0' | 40 | 0 |
| 51.0'-72.0' | 40 | 11.2 |
| 53.0'-72.0' | 40 | 14.5 |
| 55.0'-72.0' | 40 | Took Water |
| 57.0'-72.0' | 40 | 16 |
| 59.0'-72.0' | 40 | 16 |
| 60.0'-72.0' | 40 | Took Water |

Test Boring No. 3 page 3

| Depth (ft) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 61.0'-72.0' | 40 | 0 |
| *60.5'-72.0' | 40 | 23 |

* Packers seated over fracture zone. Water loss occurred 60.5'-61.0'

Depth 27.0'-32.0': Packers would not seat

Location MINK CREEK SCOTTSVILLE, VA.

BORING LOG

Structure DAM

Geologist S.G.W.

Engineer ——

Comm. No. 1176

Sheet 1 of 2

Boring No. 4

Contractor C.C.D.

Date 16 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 58.5' |
| | | | | | | | Rock 55.5' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 295.9 |
| 302.1 | 0.0 | | | | | | REMARKS |
| 301.1 | 1.0 | | FILL AND COLLUVIUM. Tan micaceous sandy clayey SILT w/rock fragments and traces of | 16 | 1' | (1) | Hole cased 6.0'. Sample 1.8'-2.8' |
| 299.1 | 3.0 | | organics. RESIDUUM. | | | | Harder @ 3.0'. Drill water greenish-tan. |
| | | | Tan, greenish-tan to brown, micaceous clayey SILT w/rock | | | | |
| | | | fragments. TOP OF WEATHERED ROCK. | 25 | 0.1' | (2) | Sample 6.0'-6.1' |
| 292.1 | 10.0 | | Greenish-tan, highly weathered, moderately to badly broken | | | | Drilling rate 9.1'-10.1' 1'/2 min. |
| | | | GREENSTONE w/scattered quartz veins and iron stained partings. | | | | Core Rec. 6.0'-11.2' 88% |
| | | | | | | | Foliation dips approx. 10°-15°. Vuggy quartz veins 8.1'-9.1' |
| | | | Sandy 9.5'-14.7'. Scattered small vugs. | | | | Greenstone is chlorite-actinolite SCHIST. |
| | | | Scattered thin zones of softer, completely decomposed rock. | | | | Harder @ 17.4'; drill water milky green to greenish-tan; |
| 282.6 | 19.5 | | | | | | milky green to milky gray |
| 282.1 | 20.0 | | TOP OF ROCK. | | | | below 19.5'. |
| | | | Green, slightly to partially weathered, partially to moderately | | | | Core blocking 11.2'-48.5'. Short pulls. |
| | | | broken GREENSTONE w/few quartz veins and occasional iron stained | | | | Core Rec. 11.2'-19.5' 99% |
| | | | partings. | | | | Softer 23.5'-24.0' w/ yellowish-green drill water. |
| | | | Badly broken 21.4'-22.0'; 23.2'-23.5'. Moderately weathered w/few vugs | | | | Core Rec. 19.5'-25.2' 94% |
| 272.1 | 30.0 | | 22.6'-23.6'. | | | | Foliation dips approx. 25°-35°. |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 2 of 2

Geologist S.G.W. | Boring No. 4

Contractor C.C.D. | Engineer —— | Date 16 DEC. 1975

| Stratification Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon Blows | Penetrtion | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Lnth of hole 58.5' |
| | | | | | | | Rock 55.5' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 285.9 |
| 277.1 | 30.0 | | | | | | |
| | | | Green, slightly to partially weathered, moderately broken | | | | Core Rec. 25.2'-32.2' |
| | | | GREENSTONE w/ quartz veins. | | | | 91% |
| | | | Numerous quartz veins 25.2'-32.2' | | | | Core Rec. 32.2'-36.7' |
| | | | Badly broken 31.1'-32.4'; 33.3'-33.8'. | | | | 98% Change coring bit. |
| 262.1 | 40.0 | | | | | | Core Rec. 36.7'-37.2' 99%+ |
| | | | | | | | Quartz mass 37.0'-37.6' |
| | | | Numerous quartz veins 43.5'-46.5'. | | | | Core Rec. 37.2'-43.5' 97% |
| | | | | | | | Core broken along foliation planes in pieces |
| | | | | | | | 0.05'-0.5' thick. Core Rec. 43.5'-48.5' |
| 252.1 | 50.0 | | Moderately to badly broken 43.5'-48.5'. | | | | 86% Core ground up 47.5'-48.5' |
| | | | | | | | Scattered epidote. Drilling rate 56.5'-57.5' |
| | | | | | | | 1'/5 min. Core Rec. 48.5'-68.5' |
| | | | | | | | 99%+ Core is less broken. |
| | | | | | | | Drilled side of quartz vein 49.7'-53.4'. |
| 243.6 | 58.5 | | BOTTOM OF HOLE. Completed 3:40 P.M. 16 Dec. 1975 | | | | W.L. @ completion - 15.6'. W.L. 12:11 P.M. 19 Dec. 1975- 16.2'. |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 4

PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 15.0'-20.0' | 10 | 4 |
| | 20 | 4 |
| | 30 | 4 |
| | 40 | 19 |
| | 30 | 17 |
| | 20 | 11.5 |
| | 10 | 10 |
| 20.0'-25.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 1 |
| | 40 | 1.5 |
| 25.0'-30.0' | 10 | 0.5 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| 30.0'-35.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0.5 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |
| 35.0'-58.5' | 10 | 0 |
| | 20 | 0.5 |
| | 30 | 0 |
| | 40 | 0.5 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |



cont.

Test Boring No. 4 page 2

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 40.0'-45.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |
| 45.0'-50.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |

Pressure tested from bottom hole, upward.

Location MINK CREEK, SCOTTSVILLE, VA. BORING LOG Comm. No. 1176

Structure DAM Sheet 1 of 2

Geologist S.G.W. Boring No. 5

Contractor C.C.O. Engineer — Date 1 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 40.0' |
| | | | | | | | Rock 34.9' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 284.3 |
| 287.3 | 0.0 | | | | | | REMARKS |
| | | | ALLUVIUM. Brown-gray micaceous clayey to sandy SILT w/occasional rock fragments. Scattered iron stains | 3 | 1' | | Hole cased 5.4'. |
| | | | | | | (1) | Sample 1.5'-2.5' |
| 284.9 | 2.4 | | and organics. | | | | Drill water tan and drill |
| | | | RESIDUUM. | | | | chattering @ 3.5'. |
| 282.2 | 5.1 | | Tan to green-tan, micaceous clayey | | | | |
| | | | SILT w/rock fragments. | 50 | 0.1' | (2) | Sample 5.0'-5.1' |
| | | | TOP OF WEATHERED ROCK. | | | | Drill water greenish-tan |
| | | | Green to greenish-tan highly | | | | to tan 5.1'-10.0', then |
| | | | weathered and badly broken | | | | milky green. |
| 277.4 | 9.9 | | GREENSTONE. Includes iron | | | | Core Rec. 5.1'-10.6' |
| | | | stained partings. | | | | 86% |
| | | | TOP OF ROCK. | | | | |
| | | | Green partially weathered and | | | | Greenstone is chlorite- |
| | | | broken GREENSTONE w/ | | | | actinolite SCHIST. |
| | | | scattered quartz veins and | | | | |
| | | | occasional quartz masses. | | | | Core blocked @ 17.5'. |
| | | | | | | | Core Rec. 10.6'-17.5' |
| | | | | | | | 93% |
| 267.3 | 20.0 | | | | | | Stopped @ 5:00 P.M. |
| | | | | | | | Drilling rate 19.5'-21.5' |
| | | | | | | | 1'/3 min. |
| | | | | | | | Softer 19.0'-20.0'; |
| | | | | | | | core is floggy. |
| | | | | | | | Core blocked. |
| | | | | | | | Core Rec. 17.5'-23.4' |
| | | | | | | | 86% |
| | | | Badly broken 27.2'-28.2'; | | | | Core breaks along foliation planes in pieces 0.1'-0.5' thick. Foliation dips 25°-45°. |
| | | | 29.4'-30.2'. | | | | Core blocked. |
| 257.3 | 30.0 | | | | | | Core Rec. 23.4'-28.2' |
| | | | VII-38 | | | | 99% |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 2 of 2

Geologist S.G.W. | Boring No. 5

Contractor C.C.D. | Engineer — | Date 2 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 40.0' |
| | | | | | | | Rock 34.9' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 284.3 |
| 257.3 | 39.0 | | | | | | REMARKS |
| | | | Green, slightly weathered, | | | | Core blocked. |
| | | | partially to moderately broken | | | | Core Rec. 28.2'-31.7' |
| | | | GREENSTONE w/scattered thin | | | | 97% |
| | | | quartz veins and occasional | | | | Increased quartz masses |
| | | | quartz masses. | | | | 29.7'-31.4' (up to 0.3' |
| | | | | | | | thick). |
| | | | | | | | Drilling rate 35.7'-36.7' |
| | | | | | | | 1'/10 min. |
| 247.3 | 40.0 | | | | | | Core blocked. |
| | | | | | | | Core Rec. 31.7'-37.7' |
| | | | BOTTOM OF HOLE. | | | | 92% |
| | | | Completed 11:40 A.M. | | | | Core Rec. 37.7'-40.0' |
| | | | 2 Dec. 1975 | | | | 99%+ |
| | | | | | | | W.L. @ completion - 9.2' |
| | | | | | | | W.L. 7:55 A.M. 4 Dec. 1975 - |
| | | | | | | | 3.0' |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 5

PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 6.7'-11.7' | 10 | 0 |
| | 20 | 0 |
| | 30 | 1.8 |
| | 40* | 24 |
| | 30 | 15.6 |
| | 20 | 5.6 |
| | 10 | 1.4 |

* Water in creek coming out muddy

| | | |
|---|---|---|
| 11.7'-40.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176
Structure DAM | Sheet 1 of 2
Geologist S.G.W. | Boring No. 6
Contractor C.C.D. | Engineer —— | Date 2 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 41.0' |
| | | | | | | | Rock 34.7' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 284.1 |
| 293.9 | 2.0 | | | | | | REMARKS |
| | | | ALLUVIUM. | | | | Hole cased 6.0' |
| | | | Mottled gray and tan micaceous | 4 | 1' | 1 | Sample 1.5'-2.5' |
| | | | clayey sandy SILT w/rock fragments | | | | Gray cuttings @ 3.5'. |
| | | | and traces organics. | | | | |
| 283.2 | 5.7 | | RESIDUUM. | 18 | 1' | 2 | Sample 5.0'-6.0' |
| 282.6 | 6.3 | | Brown micaceous clayey SILT to | | | | Decomposed greenstone. |
| | | | SILT w/decomposed rock fragments. | | | | Drill water tan to 6.5'; |
| | | | TOP OF WEATHERED ROCK. | | | | then greenish-tan. |
| 279.5 | 9.4 | | | | | | |
| 273.9 | 10.0 | | Green to greenish-tan, moderately | | | | Drilling rate 7.7'-9.7' |
| | | | to highly weathered, badly broken | | | | 1'/2 min. |
| | | | GREENSTONE w/few quartz veins | | | | Core Rec. 6.0'-11.2' |
| | | | and iron stained partings. | | | | 88% |
| | | | TOP OF ROCK. | | | | |
| | | | Green, slightly to partially | | | | Greenstone is chlorite- |
| | | | weathered, slightly broken | | | | actinolite SCHIST. |
| | | | GREENSTONE w/scattered | | | | Foliation dips approx. 25° |
| | | | quartz veins. Few quartz masses | | | | Drill water milky green |
| | | | up to 0.2' thick. | | | | below 10.0'. |
| 269.9 | 20.0 | | | | | | Drilling rate 13.2'-15.2' |
| | | | Badly broken 13.4'-14.1'. | | | | 1'/2.5 min. |
| | | | | | | | Core Rec. 11.2'-21.2' |
| | | | | | | | 99% + |
| | | | | | | | |
| | | | | | | | |
| 258.9 | 30.0 | | | | | | |
| | | | | | | | |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 2 of 2

Geologist S.G.W. | Boring No. 6

Contractor C.C.D. | Engineer — | Date 3 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 41.0' |
| 253.9 | 35.0 | | | | | | Rock 34.7' |
| | | | Green, slightly to partially weathered, slightly broken | | | | Wt of hammer 140# |
| | | | GREENSTONE w/scattered quartz veins and occasional | | | | Av fall of ham 30" |
| | | | quartz masses. | | | | El of grd. water 284.1 |
| | | | Badly broken 33.3'-35.7'. | | | | Core Rec. 21.2'-31.2' |
| | | | | | | | 99%+ |
| | | | | | | | Quartz masses 31.2'-32.0' |
| | | | | | | | Broken zone 34.2'-34.5'. |
| | | | | | | | Core blocked. |
| | | | | | | | Core Rec. 31.2'-35.7' |
| | | | | | | | 98% |
| | | | | | | | Quartz masses 33.7'-34.6'. |
| 248.9 | 40.0 | | | | | | Core blocked. |
| | | | | | | | Core Rec. 35.7'-38.4' |
| 247.9 | 41.0 | | BOTTOM OF HOLE. | | | | 96% |
| | | | Completed 9:16 A.M. | | | | Core moderately to badly |
| | | | 3 Dec. 1975 | | | | broken in pieces 0.05' to |
| | | | | | | | 0.4' thick from 35.7'-41.0'. |
| | | | | | | | Core Rec. 38.4'-41.0' |
| | | | | | | | 92% |
| | | | | | | | W.L. @ completion - 7.7' |
| | | | | | | | W.L. 7:34 A.M. 17 Dec. 1975- |
| | | | | | | | 4.8' |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 6

PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 6.7'-11.7' | 10 | 0 |
| | 20 | 15.6 |
| | 10 | 7.8 |
| 11.7'-41.0' | 10 | 0 |
| | 20 | 7.8 |
| | 10 | 1.8 |

Location MINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 1 of 2

Contractor C.C.D. | Geologist S.G.W. | Boring No. 7

Engineer —— | Date 3 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | Sample No. | Lnth of hole 40.2' |
| | | | | | | | Rock 35.2' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 285.2 |
| 286.3 | 0.0 | | | | | | REMARKS |
| | | | ALLUVIUM. Gray to tan micaceous | | | | Hole cased 5.0' |
| | | | sandy clayey SILT w/rock fragments | 4 | 1' | | Sample 1.5'-2.5' |
| 284.3 | 2.5 | | and traces organics. | | | | Topped to 2.7' |
| | | | RESIDUUM. Green to greenish-tan | | | | Harder @ 3.6'; top of |
| | | | micaceous clayey SILT w/rock | | | | weathered rock. |
| 281.8 | 5.0 | | fragments. | 25 | 0.0' | (2) | Sample 5.0'-5.0' |
| | | | TOP OF ROCK. | | | | Bouncing. No Recovery. |
| | | | Green, slightly weathered, | | | | Drill water milky green. |
| | | | moderately to badly broken | | | | Drilling rate 9.0'-10.0' |
| 276.8 | 10.0 | | GREENSTONE w/ scattered | | | | 1'/2.5 min. |
| | | | quartz veins and occasional | | | | Core Rec. 5.0'-10.7' |
| | | | quartz masses. | | | | 91% |
| | | | | | | | Core broken in pieces |
| | | | | | | | 0.05' to 0.4' thick along |
| | | | Badly broken 5.0'-7.1', 15.2'-16.6'. | | | | foliation planes. |
| | | | | | | | Foliation dips approx. 15°-30°. |
| | | | | | | | Greenstone is chlorite- |
| | | | | | | | actinolite SCHIST. |
| | | | | | | | Core blocked. |
| 266.8 | 20.0 | | | | | | Core Rec. 10.7'-13.0' |
| | | | | | | | 74% |
| | | | | | | | Core Rec. 13.0'-16.2' |
| | | | | | | | 97% |
| | | | | | | | Drilling rate 19.6'-20.6' |
| | | | | | | | 1'/4.5 min. |
| | | | | | | | Core Rec. 16.2'-21.2' |
| | | | | | | | 92% |
| | | | | | | | New coring bit. |
| | | | | | | | Hole reamed to 10.0' |
| 256.8 | 30.0 | | | | | | Core Rec. 21.2'-25.2' |
| | | | VII-44 | | | | 95% |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 2 of 2

Geologist S.G.W. | Boring No. 7

Contractor C.C.D. | Engineer — | Date 4 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 40.2' |
| | | | | | | | Rock 35.2' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 285.2 |
| 256.3 | 32.0 | | | | | | REMARKS |
| | | | Green, slightly weathered, moderately to badly broken GREENSTONE w/ scattered quartz veins and occasional quartz masses. | | | | Core blocked. Core Rec. 25.2'-29.2' 88% Scattered pyrite. |
| | | | | | | | Core blocked. Core Rec. 29.2'-36.2' |
| | | | Slightly to partially broken 29.2'-32.6'; 36.2'-40.2'. | | | | 99% Scattered quartz masses |
| | | | Badly broken 32.6'-34.4'. | | | | 33.0'-36.0' Some epidote. Drilling rate 36.2'-39.2' |
| 245.6 | 40.2 | | BOTTOM OF HOLE. Completed 10:05 A.M. 4 Dec. 1975 | | | | 1'/6.5 min. Core Rec. 36.2'-40.2' 99% Quartz masses 38.0'-38.7'. |
| | | | | | | | Pyrite and epidote. |
| | | | | | | | W.L. @ completion - 4.3'. Casing in. |
| | | | | | | | W.L. 7:35 A.M. 17 Dec. 1975- 1.6'. |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 7

PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 15.0'-20.0' | 10 | 0 |
| | 20 | 0 |
| | 10 | 0 |
| 20.0'-40.2' | 10 | 0 |
| | 20 | 0 |
| | 10 | 0 |

Depth 7.0'-12.0': Packers would not seat

Location: MINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176
Structure: DAM | Sheet 1 of 2
Geologist: S.G.W. | Boring No. 8
Contractor: C.C.D. | Engineer: —— | Date: 5 DEC. 1975

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Lnth of hole 49.1' |
| | | | | | | | Rock 45.6' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 284.4 |
| 275.8 | 2.0 | | | | | | REMARKS |
| | | | FILL AND COLLUVIUM. Tan micaceous sandy clayey SILT w/ rock fragments and traces organics. | 8 | 1' | | Hole cased 4.0'. Sample 1.5'-2.5' |
| 273.4 | 4.4 | | RESIDUUM. Tan to green micaceous sandy clayey SILT w/highly weathered rock fragments. | | | | Approx. 2' of fill placed for drilling pad. |
| 272.3 | 3.5 | | TOP OF WEATHERED ROCK. Green to greenish-tan highly weathered and broken GREENSTONE w/iron stained partings and few quartz veins. | | | | Single tube core barrel in @ 4.0'. Drill water green to tan 3.5'-6.4', then milky green. |
| 269.0 | 7.8 | | TOP OF ROCK. Green, slightly to partially weathered and broken GREENSTONE w/scattered quartz veins and occasional quartz masses. | | | | Core Rec. 4.0'-11.0' 64% Greenstone is chlorite-actinolite SCHIST. Core broken in pieces 0.1'-0.3' thick. Foliation dips approx 10°-20° |
| 265.8 | 11.0 | | | | | | Drilling rate 18.7'-19.7' 1'/3 min. |
| 275.8 | 20.0 | | | | | | Core Rec. 11.0'-21.2' 99% Core is less broken 11.0'-21.2' Scattered quartz masses 11.0'-13.0'. Occasional epidote. |
| 265.8 | 30.0 | | | | | | Occasional steepening of foliation dip. |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176
Structure DAM | Sheet 2 of 2
Geologist S.G.W. | Boring No. 8
Contractor C.C.O. | Engineer —— | Date 5 DEC. 1975

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Lnth of hole 49.1' |
| 235.3 | 33.3 | | | | | | Rock 45.6' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 284.4 |
| | | | | | | | REMARKS |
| | | | Green, slightly weathered and broken GREENSTONE w/scattered | | | | Core Rec. 21.2'-31.5' 94% |
| | | | quartz veins and occasional quartz masses. | | | | Recovered only 6.9' of core. Picked up 2.8' next run. |
| | | | | | | | |
| | | | | | | | Drilling rate 37.0'-38.0' 1'/4 min. |
| 255.8 | 40.0 | | | | | | Core Rec. 31.5'-38.8' 99% |
| | | | | | | | Losing water during pull; returned approx. 2 min. |
| | | | | | | | after drilling resumed. Broken zone @ 36.2'-36.4'; |
| | | | | | | | 37.3'-37.8' |
| | | | | | | | |
| 246.7 | 49.1 | | BOTTOM OF HOLE. | | | | Core Rec. 38.8'-49.1' 98% |
| | | | Completed 3:15 P.M. 5 Dec. 1975 | | | | Core broken in pieces 0.05'-0.3' thick w/scattered |
| | | | | | | | flaggy partings 38.8'-49.1' |
| | | | | | | | W.L.@ completion - 8.5'. |
| | | | | | | | W.L. 7:37 A.M. 17 Dec. 1975- 11.4'. |
| | | | VII-48 | | | | |
| | | | | | | | |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 8

PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 7.0'-12.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 3.4 |
| | 40 | 13 |
| | 30 | 8 |
| | 20 | 3.6 |
| | 10 | 1.4 |
| 12.0'-49.1' | 10 | 20 |
| | 20 | 31 |
| | 25 | 30.2 |
| | 20 | 22.4 |
| | 10 | 12 |
| 12.0'-17.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |
| 17.0'-22.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |



cont.

Test Boring No. 8 page 2

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 22.0'-27.0' | 10 | 3 |
| | 20 | 7 |
| | 30 | 10 |
| | 40 | 15 |
| | 30 | 5 |
| | 20 | 2.5 |
| | 10 | 0 |
| 27.0'-32.0' | 10 | 2.5 |
| | 20 | 6.5 |
| | 30 | 6 |
| | 40 | 10 |
| | 30 | 6 |
| | 20 | 0 |
| | 10 | 0 |
| 32.0'-37.0' | 10 | 16 |
| | 20 | 22.5 |
| | 30 | 27 |
| | 40 | 30.5 |
| | 30 | 29 |
| | 20 | 14 |
| | 10 | 4.5 |
| 37.0'-42.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |

Test Boring No. 8 page 3

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 42.0'-49.1' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176
Structure DAM | Sheet 1 of 2
Geologist S.G.W. | Boring No. 9
Contractor C.C.O. | Engineer — | Date 9 DEC. 1975

| Stratification Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| 328.1 | 0.0 | | | | | | Lnth of hole 60.5' |
| 327.1 | 1.0 | | FILL. Tan micaceous clayey SILT to silty CLAY w/rock fragments. | | | | Rock 58.7' |
| 325.3 | 1.3 | | RESIDUUM. Tan micaceous clayey | 50 | 0.3' | | Wt of hammer 140# |
| | | | SILT to silty CLAY w/rock fragments. | | | | Av fall of ham 30" |
| | | | TOP OF WEATHERED ROCK. | | | | El of grd. water 305.9 |
| | | | Tan to greenish-tan, highly | | | | Hole cased 4.0'. |
| | | | weathered and badly broken | | | | Sample 1.5'-1.8' |
| | | | GREENSTONE w/iron stained | | | | Core Rec. 0.0'-1.5' |
| | | | and occasionally clayey partings. | | | | 27% |
| | | | Scattered quartz veins. | | | | Core Rec. 1.5'-3.5' |
| 318.1 | 13.0 | | | | | | 30% |
| | | | | | | | Core Rec. 3.5'-6.0' |
| | | | | | | | 12% |
| | | | | | | | Greenstone is chlorite-actinolite SCHIST. |
| | | | | | | | Foliation dips appro. 15°-30°. |
| | | | | | | | Core Rec. 6.0'-11.0' |
| | | | | | | | 64% |
| | | | | | | | Drilling rate 13.0'-14.0' 1'/1.5 min. |
| | | | | | | | Core blocking 16.1'-41.0'. |
| | | | | | | | Core Rec. 11.0'-16.1' |
| 303.1 | 20.3 | | | | | | 71% |
| | | | Occasional rugs from 20.7'-24.7' | | | | Core Rec. 16.1'-20.7' |
| | | | along iron stained partings. | | | | 43% |
| | | | | | | | Drilling rate 20.7'-21.7' |
| | | | Floppy partings @ 24.1'. | | | | 1'/2 min. |
| 303.4 | 24.7 | | TOP OF ROCK. | | | | Drill water greenish-tan to |
| | | | Green, slightly to partially | | | | tan and alternating hard |
| | | | weathered and broken GREENSTONE | | | | and soft zones to 24.7'. |
| | | | w/scattered quartz veins and few | | | | Drilling rate 23.7'-24.7' |
| 298.1 | 30.0 | | iron stained partings. | | | | 1'/6.5 min. |
| | | | | | | | Core Rec. 20.7'-26.4' |
| | | | VII-52 | | | | 70% |
| | | | | | | | Core ground up 24.7'-26.4'. |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure DAM | Sheet 2 of 2

Geologist S.G.W. | Boring No. 9

Contractor C.C.D. | Engineer —— | Date 9 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 60.5' |
| 338.1 | 50.0 | | | | | | Rock 58.7' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 305.9 |
| | | | | | | | REMARKS |
| | | | Green, slightly to petially weathered and broken GREENSTONE | | | | Drill water milky green. Core Rec. 26.4'-32.0' |
| | | | w/scattered quartz veins and few iron stained partings. | | | | 89% Quartz masses 32.0'-32.2'; |
| | | | Few iron stains below 34.6'. | | | | 33.9'-34.6' Core broken along foliation |
| | | | | | | | planes in pieces 0.05'-0.7' thick. |
| 238.1 | 40.0 | | | | | | Core Rec. 32.0'-41.0' |
| | | | | | | | 96% |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | Left 1.1' core in hole @ 51.0'; |
| 278.1 | 50.0 | | | | | | picked up on next run. Core Rec. 41.0'-51.0' |
| | | | | | | | 99% Core is less broken 41.0'-51.0' |
| | | | | | | | Drilling rate 55.0'-56.0' 1'/4.5 min. |
| | | | | | | | Scattered quartz masses 55.1'-56.5' |
| | | | | | | | Core Rec. 51.0'-60.5' 95% |
| | | | BOTTOM OF HOLE. | | | | Left rest of core in hole. W.L.@ completion - 13.2'. |
| 267.6 | 60.5 | | Completed 3:35 P.M. 9 Dec. 1975 | VII-53 | | | W.L. 7:41 A.M. 17 Dec. 1975 - 22.2' |

HINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 9

## PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 17.0'-22.0' | 10 | 1 |
| | 20 | 0.2 |
| | 30 | 0.4 |
| | 40 | 0.4 |
| | 30 | 0.6 |
| | 20 | 0.8 |
| | 10 | 0 |
| 22.0'-60.5' | 10 | 0 |
| | 20 | 0.4 |
| | 30 | 1 |
| | 40 | 4.8 |
| | 30 | 4.6 |
| | 20 | 3.8 |
| | 10 | 2.2 |

Depth 12.0'-17.0': Packers would not seat

Location: MINK CREEK, SCOTTSVILLE, VA. — BORING LOG — Comm. No. 1176
Structure: DAM — Sheet 1 of 3
Geologist: S.G.W. — Boring No. 10
Contractor: C.C.D. — Engineer: ——— — Date: 10 DEC. 1975

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Lnth of hole 21.5' |
| | | | | | | | Rock 77.5' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 301.3 |
| 344.1 | 3.3 | | | | | | REMARKS |
| 344.3 | 3.5 | | FILL. Tan to greenish-tan, micaceous clayey SILT to silty CLAY w/ rock fragments and organics. | 5 | 1' | | Hole cased 4.0'. Sample 1.5'-2.5' |
| | | | RESIDUUM. | | | | |
| 341.1 | 4.0 | | Tan to greenish-tan, micaceous | | | | Core Rec. 4.0'-5.3' |
| | | | clayey SILT to silty CLAY w/ red | | | | 38% |
| | | | mottling and rock fragments. | 25 | 0.2' | | Sample 5.3'-5.5' |
| | | | TOP OF WEATHERED ROCK. | | | | |
| | | | Tan to greenish-tan, highly | | | | Drilling rate 7.5'-8.5' |
| | | | weathered and badly broken | | | | 1'/2.5 min. |
| 335.1 | 13.0 | | GREENSTONE w/ sandy schistose | | | | Drill water tan to greenish-tan. |
| | | | interbeds. Includes iron stained | | | | Core Rec. 5.3'-11.5' |
| | | | and some clayey partings. | | | | 80% |
| | | | | | | | Broken along foliation planes; |
| | | | Wavy, iron stained partings | | | | some clayey partings. |
| | | | 10.1'-10.3' | | | | Foliation dips approx. |
| | | | | | | | 30°-45°. |
| | | | | | | | Drilling rate 16.5'-17.5' |
| | | | | | | | 1'/4 min. |
| 325.1 | 20.0 | | | | | | Core blocking 11.5'-46.0'; |
| | | | | | | | short pulls. |
| | | | | | | | Core Rec. 11.5'-20.9' |
| | | | | | | | 45% |
| | | | | | | | Lost water @ 21.0'. |
| | | | | | | | Joints dip approx. 85°. |
| | | | | | | | Core Rec. 20.9'-26.1' |
| | | | | | | | 62% |
| | | | | | | | |
| 316.1 | 29.0 | | VII-55 | | | | Drilling tighter and |
| 315.1 | 30.0 | | Green partially weathered, moderately | | | | harder @ approx. 29.0'. |
| | | | broken GREENSTONE w/ few quartz | | | | |
| | | | veins and iron stained partings. | | | | |

Location: WINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure: DAM | Sheet 2 of 3

Geologist: S.G.W. | Boring No. 10

Contractor: C.C.D. | Engineer: — | Date: 10 DEC. 1975

| Stratification Elev. | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| 315.1 | 0.0 | | | | | | Lnth of hole 81.5' |
| | | | Green partially weathered, moderately broken GREENSTONE w/few quartz | | | | Rock 77.5' |
| | | | veins and iron stained partings. | | | | Wt of hammer 140# |
| | | | Highly weathered to completely | | | | Av fall of ham 30" |
| | | | decomposed, badly broken and | | | | El of grd. water 301.3 |
| | | | silty clay partings 33.4'-36.4'. | | | | Drilling rate 30.1'-31.1' 1'/7 min. |
| | | | | | | | Drill water returned @ 32.2'; tan to greenish-tan. |
| | | | | | | | Core Rec. 26.1'-35.0' 62% |
| | | | | | | | Lost water when core pulled; returned @ 37.0'. |
| 305.1 | 49.9 | | Greenish-tan, moderately weathered | | | | Drill water brown 40.1'-40.4' then olive @ 40.6'. |
| | | | and broken 36.4'-44.8'; badly | | | | Core Rec. 35.0'-40.8' 76% |
| | | | broken 43.6'-44.8'. | | | | Foliation dips approx. 30°-40°. |
| 300.3 | 44.8 | | TOP OF ROCK. | | | | Lost water when core pulled; returned @ 44.8'. |
| | | | Green, slightly to partially | | | | Core Rec. 40.8'-46.0' 85% |
| | | | weathered and broken GREENSTONE | | | | Lost water when core pulled; returned when core pulled @ 56.0'. |
| 295.1 | 50.9 | | w/few quartz veins. | | | | Drilling rate 52.0'-53.2' 1'/6 min. |
| | | | Moderately to badly broken | | | | Core Rec. 46.0'-56.2' 99% |
| | | | 51.8'-52.4'. | | | | Greenstone is chlorite-actinolite SCHIST. |
| | | | | | | | Stopped 5:00 P.M. Water did not return below 56.0'. |
| 285.1 | 60.0 | | VII-56 | | | | |

Location: LINK CREEK, SCOTTSVILLE, VA.
Contractor: C.C.D.

**BORING LOG**

Structure: DAM
Geologist: S.G.W.
Engineer: ——

Comm. No. 1176
Sheet 3 of 3
Boring No. 10
Date 11 DEC. 1975

| Stratification: Elevation | Stratification: Length | Stratification: Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Misc. Data |
| | | | | | | | Lnth of hole 21.5' |
| | | | | | | | Rock 77.5' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 301.3 |
| | | | | | | | REMARKS |
| | | | Green, slightly to partially weathered and broken GREENSTONE | | | | Drilling rate 60.2'-61.2' 1'/4 min. |
| | | | w/few quartz veins. | | | | Quartz masses up to 0.2' thick @ 57.3', 60.0', 60.3', 60.6' and 66.1'-66.3'. |
| | | | | | | | Core Rec. 56.2'-66.3' |
| | | | | | | | 99% |
| | | | | | | | Quartz masses 67.3'-67.4'. |
| 275.1 | 77.0 | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | Badly broken 75.6'-76.1'. | | | | |
| | | | | | | | Core Rec. 66.3'-76.5' |
| | | | | | | | 98% |
| | | | | | | | Scattered epidotized partings. |
| 235.1 | 33.0 | | | | | | |
| 223.6 | 91.5 | | BOTTOM OF HOLE. | | | | Core Rec. 76.5'-81.5' |
| | | | Completed 10:10 A.M. 11 Dec. 1975 | | | | 98% |
| | | | | | | | Quartz @ 80.7'-80.8'. |
| | | | | | | | W.L.@ completion - 36.5'. |
| | | | | | | | W.L. 7:47 A.M. 17 Dec. 1975- 43.6'. |
| | | | | | | | |
| | | | | | | | |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO.10

## PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 27.0'-32.0' | 10 | 26 |
| | 20 | 30.5 |
| | 30 | 35.5 |
| | 40 | 40.4 |
| | 30 | 33.5 |
| | 20 | 28.5 |
| | 10 | 38 |
| 32.0'-81.5' | 10 | 4.5 |
| | 20 | 5 |
| | 30 | 6.5 |
| | 40 | 8.5 |
| | 30 | 5.5 |
| | 20 | 4 |
| | 10 | 2.5 |
| 32.0'-37.0' | 10 | 2.5 |
| | 20 | 4 |
| | 30 | 5 |
| | 40 | 6.5 |
| | 30 | 4.5 |
| | 20 | 4 |
| | 10 | 3 |
| 37.0'-81.5' | 10 | 2.4 |
| | 20 | 2.6 |
| | 30 | 4 |
| | 40 | 4.6 |
| | 30 | 1.2 |
| | 20 | 4.8 |
| | 10 | 2 |

Test Boring No. 10 page 2

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 42.0'-81.6' | 10 | 3.5 |
| | 20 | 3 |
| | 30 | 3.5 |
| | 40 | 4.5 |
| | 30 | 3.5 |
| | 20 | 2 |
| | 10 | 2 |

Depth 17.0'-22.0': Packers would not seat

Location: RINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176
Structure: DAM | Sheet 1 of 2
Geologist: S.G.W. | Boring No. 11
Contractor: C.C.D. | Engineer: — | Date: 15 DEC. 1975

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 2.2 | | ALLUVIUM. Tan micaceous slightly clayey, sandy SILT w/ scattered rock | 12 | 1' | (1) | Lnth of hole 44.5'<br>Rock 39.7'<br>Wt of hammer 140#<br>Av fall of ham 30"<br>El of grd. water 273.9<br>Hole cased 6.0'<br>Sample 1.5'-2.5' |
| 273.0 | 3.5 | | fragments and traces organics. RESIDUUM. Tan to brown micaceous | | | | Rock fragments up to gravel size. |
| 271.3 | 4.3 | | sandy clayey SILT w/ rock fragments. TOP OF WEATHERED ROCK. | | | | Harder @ 3.5' |
| | | | Green to greenish-tan, moderately to highly weathered badly broken | 25 | 0.0' | (2) | Sample 6.0'-6.0'<br>Core Rec. 3.6'-6.0' |
| 273.6 | 13.3 | | GREENSTONE w/ scattered quartz veins. Includes iron stained | | | | 21%<br>Harder @ 8.3' |
| 275.3 | 11.0 | | partings. TOP OF ROCK. | | | | Core Rec. 6.0'-11.0'<br>72% |
| | | | Green, slightly to partially weathered and broken GREENSTONE | | | | Some vuggy quartz veins.<br>Change coring bit. |
| | | | w/ scattered quartz veins. Moderately to badly broken 11.4'-16.7'. | | | | Core Rec. 11.0'-11.4'<br>83% |
| | | | | | | | Drilling rate 13.4'-15.4'<br>1'/4.75 min. |
| 265.6 | 23.0 | | / | | | | Drill water greenish-tan to tan to approx. 11.0'; then milky green. |
| | | | | | | | Core blocked. |
| | | | Numerous quartz veins 11.0'-36.5'. | | | | Core Rec. 11.4'-15.3'<br>99%+ |
| | | | Foliation dips approx. 40° w/local steepening. Fold present 16.7'-18.7'; | | | | Slickensides @ 12.9'<br>Greenstone is chlorite-actinolite SCHIST. |
| | | | includes yellowish-green mica. | | | | Core blocked. |
| 256.6 | 30.0 | | Badly broken 22.3'-23.6'. | | | | Core Rec. 15.3'-24.3'<br>93% |

Location MINK CREEK SCOTTSVILLE, VA.

Contractor C.C.D.

BORING LOG

Structure DAM

Geologist S.G.H.

Engineer ——

Comm. No. 1176

Sheet 2 of 2

Boring No. 11

Date 15 DEC. 1975

| Stratification Elevation | Stratification Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| 253. | 30.2 | | | | | | Lnth of hole 44.5' |
| | | | | | | | Rock 39.7' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 283.9 |
| | | | Green, slightly to partially weathered and broken GREENSTONE w/scattered quartz veins. | | | | Scattered epidote. |
| | | | | | | | Core Rec. 24.3'-34.5' |
| | | | Badly broken 24.3'-25.0'; 32.3'-33.3' | | | | 95% |
| | | | | | | | Local steepening of foliation; near horizontal 30.6'-31.8'. |
| 243.3 | 40.2 | | Badly broken 35.1'-36.5'; 41.5'-44.5' | | | | Breaks along foliation planes. |
| | | | | | | | |
| | | | | | | | Core Rec. 34.5'-44.5' |
| 242.1 | 44.5 | | BOTTOM OF HOLE. Completed 1:10 P.M. 15 Dec. 1975 | | | | 95% |
| | | | | | | | Foliation near horizontal to approx. 45°. |
| | | | | | | | W.L. @ completion - 3.8'. |
| | | | | | | | W.L. 7:30 A.M. 17 Dec. 1975 - 2.7' |

MINK CREEK DAM
Comm. No. 1176

TEST BORING NO. 11

## PRESSURE TESTING

| Depth (Ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 7.0'-12.0' | 10* | 4.5 |
| | 20 | 18 |
| | 30 | 30.5 |
| | 40 | 32.5 |
| | 30 | 31 |
| | 20 | 24.5 |
| | 10 | 14.5 |

* Note: Mud coming out in base of creek bank next to drill.

| | | |
|---|---|---|
| 12.0'-44.5' | 10 | 8 |
| | 20 | 12 |
| | 30 | 16 |
| | 40* | 26 |
| | 30 | 19.5 |
| | 20 | 9.5 |
| | 10 | 0 (backpressure) |
| 17.0'-22.0' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |
| 22.0'-44.5' | 10 | 9.5 |
| | 20 | 10.5 |
| | 30 | 14 |
| | 40 | 22 |



cont.

Test Boring No. 11 page 2

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 22.0'-44.5 | 30 | 10.5 |
| | 20 | 0 |
| | 10 | 0 (backpressure) |
| 27.0'-44.5' | 10 | 10.5 |
| 32.0'-44.5' | 10 | 7.5 |
| 37.0'-44.5' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |
| 32.0'-37.0' | 10 | 11 |
| | 20 | 12 |
| | 30 | 15.5 |
| | 40 | 20.5 |
| | 30 | 13 |
| | 20 | 1 |
| | 10 | 0 (backpressure) |

Location: MINK CREEK, SCOTTSVILLE, VA. — BORING LOG — Comm. No. 1176
Structure: DAM — Sheet 1 of 2
Geologist: S.G.W. — Boring No. 12
Contractor: C.C.D. — Engineer: — — Date: 11 DEC. 1975

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | Misc. Data: Lnth of hole 43.7'; Rock 39.2'; Wt of hammer 140#; Av fall of ham 30"; El of grd. water 295.6 | | | | |
| | | | ALLUVIUM. | | | | Hole cased 5.0' |
| | | | Tan, micaceous, clayey sandy | 4 | 1' | (1) | Sample 1.5'-2.5' |
| | | | SILT w/organics. | | | | Weathered greenstone |
| 294.3 | 5.0 | | RESIDUUM. | | | | fragments @ 3.5'. Hard @ 4.0'. |
| 293.3 | 6.5 | | Tan, micaceous sandy SILT; slightly | 25 | 0.3' | (2) | Sample 4.2'-4.6' |
| | | | clayey. Decomposed greenstone. | | | | Drill water alternating |
| | | | TOP OF WEATHERED ROCK. | | | | greenish-tan to brown; |
| | | | Greenish-tan to green, highly | | | | milky green @ 7.2'. |
| 278.3 | 19.5 | | fractured, badly broken | | | | |
| | | | GREENSTONE w/iron stained | | | | Core Rec. 4.5'-10.5' |
| | | | partings and few quartz veins. | | | | 63% |
| | | | Less broken and occasional iron | | | | Greenish-tan water @ 12.8'. |
| | | | stains 13.5'-13.7'. | | | | Core blocked @ 13.7'. |
| 276.3 | 19.7 | | TOP OF ROCK. | | | | Core Rec. 10.5'-13.7' |
| | | | Green, slightly weathered and | | | | 66% |
| | | | broken GREENSTONE w/scattered | | | | Drilling rate 14.7'-15.7' |
| | | | quartz veins and few iron stained | | | | 1/4 min. |
| | | | partings. Traces of iron stains | | | | Drill water milky green. |
| | | | below 16.0'. | | | | Foliation dips approx. |
| 268.3 | 29.7 | | | | | | 25°-40°. |
| | | | | | | | Quartz masses 18.5'-19.0'. |
| | | | | | | | Greenstone is chlorite- |
| | | | | | | | actinolite SCHIST. |
| | | | | | | | Core Rec. 13.7'-24.1' |
| | | | | | | | 99% |
| | | | | | | | Quartz masses 21.4'-24.7' |
| | | | | | | | Broken along foliation planes |
| 254.3 | 30.0 | | VII-64 | | | | in pieces 0.5'-0.05' thick |
| | | | | | | | @ 26.2'-30.8'. |
| | | | | | | | Badly broken 29.1'-30.8'. |

Location MINK CREEK SCOTTSVILLE, VA. BORING LOG Comm. No. 1176

Structure DAM Sheet 2 of 2

Geologist S.G.W. Boring No. 12

Contractor C.C.D. Engineer —— Date 11 DEC. 1975

| Stratification Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon Blows | Sampler or Spoon Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Lnth of hole 43.7' |
| | | | | | | | Rock 39.2' |
| | | | | | | | Wt of hammer 140# |
| | | | | | | | Av fall of ham 30" |
| | | | | | | | El of grd. water 285.6 |
| 253.3 | 33.3 | | | | | | |
| | | | Green, slightly weathered and broken GREENSTONE w/scattered quartz veins. | | | | Core blocking 30.8'-43.7'. Short pulls. |
| | | | | | | | Core Rec. 24.1'-30.3' 96% |
| | | | Badly broken 32.0'-32.2'. | | | 1 | Slick partings 26.2'-30.8'. Rock may be approaching soapstone composition. |
| | | | | | | | Core Rec. 30.8'-32.5' |
| 249.3 | 40.0 | | | | | | 94% Foliation steepened to 75°-85° |
| | | | Moderately to badly broken 40.9'-43.7'. | | | | 31.3'-31.6'. Yellowish-green chlorite w/quartz. |
| 244.0 | 43.7 | | BOTTOM OF HOLE. | | | | Drilling rate 33.5'-34.5' 1'/10 min. |
| | | | Completed 12:25 P.M. 12 Dec. 1975 | | | | Core Rec. 32.5'-35.5' 97% |
| | | | | | | | Badly broken. Core Rec. 35.5'-43.7' |
| | | | | | | | 99%+ |
| | | | | | | | W.L. @ completion - 3.7' |
| | | | | | | | W.L. 7:32 A.M. 17 Dec. 1975 - 2.7' |
| | | | | | | | |
| | | | | | | | |
| | | | VII-65 | | | | |
| | | | | | | | |

MINK CREEK DAM

Comm. No. 1175

TEST BORING NO. 12

## PRESSURE TESTING

| Depth (ft.) | Pressure (PSI) | Loss (gpm) |
|---|---|---|
| 7.0'-12.0' | 10* | 13.6 |
| | 20 | 22.2 |
| | 30 | 33 |
| | 40 | 38 |
| | 30 | 33 |
| | 20 | 27.5 |
| | 10 | 21.0 |
| 12.0'-43.7' | 10* | 0.8 |
| | 20 | 3 |
| | 30 | 18.2 |
| | 40 | 30.2 |
| | 30 | 24.5 |
| | 20 | 17 |
| | 10 | 9 |

* Creek water muddy

| | | |
|---|---|---|
| 17.0'-43.7' | 10 | 0 |
| | 20 | 0 |
| | 30 | 0 |
| | 40 | 0 |
| | 30 | 0 |
| | 20 | 0 |
| | 10 | 0 |

Location MINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure CORROW PIT | Sheet 1 of 1

Geologist S.G.W. | Boring No. TP-1

Contractor CRITZER | Engineer —— | Date 24 FEB. 1976

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0 | | | | | | Lnth of hole 8.5' |
| | | | | | | | Rock —— |
| | | | | | | | Wt of hammer —— |
| | | | | | | | Av fall of ham —— |
| | | | | | | | El of grd. water —— |
| | | | | | | | REMARKS |
| | 0.6 | ~1~ | TOPSOIL. | | | | Jar sample taken @ 2.5' and 5.0' |
| | | ~1~ | Tan, micaceous, clayey SILT w/rock. | | | | |
| | | ~1~ | Red, micaceous, clayey SILT w/ | | | | |
| | 4.0 | ~1~ | scattered tan mottling. | | | | |
| | | · / · | RESIDUUM. | | | | Decomposed foliated |
| | | / ; \ | Olive-tan, micaceous, sandy SILT | | | | greenstone. Manganese |
| | | \ · / | w/ blocky rock fragments. | | | | stains along joints. |
| | | · / · | | | | | |
| | | \ · / | | | | | |
| | 8.5 | | | | | | Bag Sample No. 1 taken |
| | | | BOTTOM OF PIT. | | | | @ approx. 8.0'. |
| | | | Completed 9:55 A.M. | | | | |
| | | | 24 Feb. 1976 | | | | |

Location MINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Contractor CRITTER | Structure BORROW PIT | Sheet 1 of 1

Geologist S.O.W. | Boring No. TP-2

Engineer —— | Date 24 FEB. 1976

| Stratification Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 2.5 | | TOPSOIL. | | | | Misc. Data: Lnth of hole 9.0' |
| | | | Tan, micaceous clayey SILT w/roots. | | | | Rock —— |
| | 2.5 | | | | | | Wt of hammer —— |
| | | | Red to reddish-tan, micaceous | | | | Av fall of ham —— |
| | | | silty CLAY. | | | | El of grd. water —— |
| | 6.0 | | RESIDUUM. | | | | REMARKS: Bag Sample no. 2 taken @ 2.5'. |
| | | | Mottled red and tan, micaceous | | | | Jar sample taken @ 2.5', 3.5' and 6.0'. |
| | 9.0 | | sandy to clayey SILT w/blocky | | | | Residuum is foliated and includes manganese |
| | | | rock fragments. | | | | stains along joints. |
| | | | Light green, highly weathered | | | | Less weathered @ 6.0'; |
| | | | GREENSTONE. | | | | essentially a sandy SILT |
| | | | BOTTOM OF PIT. | | | | w/increase in rock |
| | | | Completed 10:20 A.M. | | | | fragments. |
| | | | 24 Feb. 1976 | | | | |

Location: MINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176
Structure: BORROW PIT | Sheet 1 of 1
Geologist: S.G.W. | Boring No. TP-3
Contractor: CRITTER | Engineer: ——— | Date: 24 FEB. 1976

| Stratification: Elevation | Stratification: Depth | Stratification: Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Lnth of hole 7.0' |
| | | | | | | | Rock — |
| | | | | | | | Wt of hammer — |
| | | | | | | | Av fall of ham — |
| | | | | | | | El of grd. water — |
| | 1.2 | | TOPSOIL. | | | | Jar samples @ 2.5' and |
| | | | Tan, micaceous, clayey SILT w/ | | | | 5.0'. |
| | 4.0 | | few rock fragments and roots. | | | | |
| | | | Red, micaceous, clayey SILT w/ | | | | Manganese stains along |
| | 6.0 | | few rock fragments. | | | | joints below 4.0' |
| | | | RESIDUUM. | | | | Hard @ 6.0' w/ increase in |
| | 7.0 | | Mottled greenish-tan and red, | | | | blocky rock fragments. |
| | | | micaceous sandy SILT w/ blocky | | | | Essentially a sandy SILT. |
| | | | rock fragments. | | | | |
| | | | Light green, highly weathered | | | | |
| | | | GREENSTONE. | | | | |
| | | | BOTTOM OF PIT. | | | | |
| | | | Completed 10:55 A.M. | | | | |
| | | | 24 Feb. 1976 | | | | |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure BORROW PIT | Sheet 1 of 1

Geologist S.G.W. | Boring No. TP-4

Contractor CRITZER | Engineer — | Date 24 FEB. 1976

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 8.0' |
| | 0.0 | | | | | | Rock — |
| | | | | | | | Wt of hammer — |
| | | | | | | | Av fall of ham — |
| | | | | | | | El of grd. water — |
| | | | | | | | REMARKS |
| | 1.0 | | TOPSOIL. | | | | Roots to 1.0'; few to 3.0' |
| | | | Tan, micaceous clayey SILT w/rock. | | | | Jar samples taken @ |
| | 3.3 | | Red, micaceous clayey SILT. | | | | 1.5' and 3.0'. |
| | | | RESIDUUM. | | | | Water trickling @ 3.5' on |
| | | | Mottled red and tan, micaceous | | | | south face of trench. |
| | 6.0 | | sandy, slightly clayey SILT w/ | | | | Digging harder @ 3.0'. |
| | | | abundant blocky rock fragments. | | | | Digging slower below 6.0'; |
| | 8.0 | | Light green, highly weathered | | | | increase in rock. |
| | | | GREENSTONE. | | | | |
| | | | BOTTOM OF PIT. | | | | |
| | | | Completed 11:20 A.M. | | | | |
| | | | 24 Feb. 1976 | | | | |

Location: MINK CREEK, SCOTTSVILLE, VA.
Contractor: CRITZER

BORING LOG
Structure: BORROW PIT
Geologist: S.G.W.
Engineer: ——

Comm. No. 1176
Sheet 1 of 1
Boring No. TP-5
Date 24 FEB. 1976

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0 | | | | | | Lnth of hole 7.0' |
| | 1.0 | | TOPSOIL. Tan, micaceous clayey SILT w/roots. | | | | Rock —— Wt of hammer —— Av fall of ham —— El of grd. water —— Roots to 1.0' and as deep as 2.5'. |
| | 2.5 | | Red, micaceous clayey SILT. RESIDUUM. | | | | Jar samples @ 2.0', 3.5' and 5.0'. |
| | 5.5 | | Greenish-tan and red, micaceous clayey SILT to sandy SILT w/blocky | | | | Bag Sample no. 3 taken @ 3.5'; increase in rock fragments. |
| | 7.0 | | rock fragments. Light green, highly weathered GREENSTONE. BOTTOM OF PIT. | | | | Harder digging @ 5.5'. Greenstone essentially a sandy SILT. |
| | | | Completed 11:55 A.M. 24 Feb. 1976 | | | | |

Location MINK CREEK SCOTTSVILLE, VA.

BORING LOG

Structure BORROW PIT

Geologist S.G.W.

Engineer ——

Comm. No. 1176

Sheet 1 of 1

Boring No. TP-6

Date 24 FEB. 1976

Contractor CRITZER

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 5.0' |
| | 0.3 | | | | | | Rock —— |
| | 1.0 | | TOPSOIL. | | | | Wt of hammer —— |
| | | | Tan micaceous clayey SILT w/roots. | | | | Av fall of ham —— |
| | 2.3 | | Tan to red micaceous clayey SILT. | | | | El of grd. water —— |
| | 4.0 | | RESIDUUM. | | | | REMARKS |
| | 5.0 | | Mottled red and olive-tan to green, micaceous sandy SILT w/ blocky rock fragments. Highly weathered, olive GREENSTONE w/scattered red streaking. BOTTOM OF PIT. Completed 1:53 P.M. 24 Feb. 1976 | | | | Roots to ± 1.0'. Weathered rock @ 2.3'. Hard @ 4.0'. Extremely hard @ 5.0'. Samples taken @ 1.5' and 2.5'. Olive-tan, highly weathered greenstone @ 2.3'. Red iron stains along joints. Some manganese stains. |

Location: MINK CREEK, SCOTTSVILLE, VA.
Contractor: CRITZER

# BORING LOG

Structure: BORROW PIT
Geologist: S.G.W.
Engineer: —

Comm. No. 1176
Sheet 1 of 1
Boring No. TP-7
Date 24 FEB. 1976

| Stratification: Elevation | Stratification: Depth | Stratification: Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Misc. Data: Lnth of hole 6.0'; Rock —; Wt of hammer —; Av fall of ham —; El of grd. water — |
| | 1.2 | | TOPSOIL. Tan micaceous clayey SILT w/roots. | | | | Roots to 1.2' w/some to 2.5'. |
| | 2.2<br>3.4 | | Red to reddish-tan, micaceous, clayey SILT w/ few rock fragments. | | | | Rock fragments @ 2.2'. Harder @ 3.4', increase in rock. |
| | 6.0 | | RESIDUUM. Red to reddish-tan, micaceous, sandy SILT w/ blocky rock fragments. Light green, highly weathered GREENSTONE. BOTTOM OF PIT. Completed 2:23 P.M. 24 Feb. 1976 | | | | Jar samples taken @ 1.0', 2.0' and 3.5'. Hard @ 6.0'. Greenstone is jointed and foliated; essentially a sandy SILT. |

Location: MINK CREEK, SCOTTSVILLE, VA.
Contractor: CRITZER

BORING LOG

Structure: BORROW PIT
Geologist: S.G.W.
Engineer: —

Comm. No. 1176
Sheet 1 of 1
Boring No. TP-8
Date 24 FEB. 1976

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.5 | | TOPSOIL. | | | | Lnth of hole 6.0' |
| | 1.5 | | Tan micaceous clayey SILT w/ | | | | Rock — |
| | 2.5 | | scattered rock fragments and roots. | | | | Wt of hammer — |
| | 4.0 | | Red to tan, micaceous, sandy slightly | | | | Av fall of ham — |
| | 6.0 | | clayey SILT w/rock fragments. RESIDUUM. | | | | El of grd. water — |
| | | | Red to green micaceous sandy SILT w/ blocky rock fragments. | | | | Roots to 0.8'. Rock fragments @ 2.0'; abundant @ 2.5'. Very hard @ 5.0' and stop @ 6.0'. Jar samples taken @ 1.3', 3.0' and 4.0'. |
| | | | Olive, highly weathered GREENSTONE. BOTTOM OF PIT. | | | | Residuum includes iron stains along joints. |
| | | | Completed 2:45 P.M. 24 Feb. 1976 | | | | |

Location: MINK CREEK, SCOTTSVILLE, VA.
Contractor: CRITZER

# BORING LOG

Structure: BORROW PIT
Geologist: S.G.W.
Engineer: ——

Comm. No. 1176
Sheet 1 of 1
Boring No. TP-9
Date 24 FEB. 1976

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0 | | | | | | Lnth of hole 7.0' |
| | | | | | | | Rock —— |
| | | | | | | | Wt of hammer —— |
| | | | | | | | Av fall of ham —— |
| | | | | | | | El of grd. water —— |
| | | | | | | | REMARKS |
| | | | TOPSOIL. | | | | Roots to ± 1.0' |
| | 1.0 | | Tan, micaceous, clayey SILT w/roots. | | | | Jar samples @ 2.0' and 4.5'. |
| | | | Red to reddish-tan, micaceous, clayey | | | | |
| | 3.5 | | SILT w/few rock fragments. | | | | Harder @ 2.0' w/rock |
| | | | RESIDUUM. | | | | fragments. Rock fragments |
| | | | Red to green, highly weathered | | | | blocky and abundant |
| | | | GREENSTONE. | | | | @ 4.0' |
| | 7.0 | | BOTTOM OF PIT. | | | | Hard @ 5.0'. |
| | | | Completed 3:40 P.M. | | | | Greenstone is essentially |
| | | | 24 Feb. 1976 | | | | a sandy SILT. Iron and |
| | | | | | | | manganese stains along |
| | | | | | | | joints. |
| | | | | | | | Foliation dips approx. |
| | | | | | | | 30°-45° S.E. |

Location: MINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure: BORROW PIT | Sheet 1 of 1

Geologist: S.G.W. | Boring No. TP-10

Contractor: CRITZER | Engineer: — | Date: 24 FEB. 1976

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0 | | | | | | Lnth of hole 9.0' |
| | | | TOPSOIL. | | | | Rock — |
| | 1.3 | | Tan, micaceous, clayey SILT w/rock. | | | | Wt of hammer — |
| | | | Red, micaceous, clayey SILT w/ | | | | Av fall of ham — |
| | 3.0 | | weathered rock fragments. | | | | El of grd. water — |
| | | | RESIDUUM. | | | | Roots to 1.5'. |
| | 5.0 | | Mixed red to green, micaceous, | | | | In one part of trench have weathered greenstone @ 2.0'. |
| | | | sandy to clayey SILT w/abundant | | | | Jar samples @ 3.0' and 5.0'. |
| | 9.0 | | rock fragments. | | | | Differentially weathered from 3.0'-5.0'. |
| | | | Green, highly weathered GREENSTONE. | | | | Iron stains and few clayey partings 5.0'-6.0'. |
| | | | BOTTOM OF PIT. | | | | Much harder 6.0'-8.0'. |
| | | | Completed 4:03 P.M. 24 Feb. 1976 | | | | Greenstone is essentially a sandy SILT. |

Location MINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure CORROW PIT | Sheet 1 of 1

Geologist S.G.W. | Boring No. TP-11

Contractor CRITZER | Engineer — | Date 24 FEB. 1976

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | |
| | 0.0 | | | | | | Lnth of hole 6.0' |
| | 1.0 | | TOPSOIL. | | | | Rock — |
| | | | Tan, micaceous, clayey SILT w/roots. | | | | Wt of hammer — |
| | 3.0 | | Tan, micaceous, clayey SILT w/ | | | | Av fall of ham — |
| | | | scattered rock fragments. | | | | El of grd. water — |
| | 6.0 | | Greenish-tan, highly weathered GREENSTONE. | | | | Roots to ± 1.0' |
| | | | | | | | Bag Sample no. 1 taken @ 2.0' |
| | | | BOTTOM OF PIT. | | | | Increase in rock fragments @ 3.0'. Harder @ 4.0' |
| | | | Completed 4:30 P.M. 24 Feb. 1976 | | | | Jar samples taken @ 2.0' and 4.0' |
| | | | | | | | At depth, the weathered rock stays tan and looks like Bag Sample no. 1. |
| | | | | | | | Very little iron staining. Extremely hard @ 6.0'. |
| | | | | | | | Water seeping in @ ± 4.0' on east end of trench. |
| | | | | | | | Greenstone essentially a sandy SILT. |

Location: LINK CREEK, SCOTTSVILLE, VA.
Contractor: CRITZER

# BORING LOG

Structure: BORROW PIT
Geologist: S.G.M.
Engineer: —

Comm. No. 1176
Sheet 1 of 1
Boring No. TP-12
Date 24 FEB. 1976

| Stratification: Elevation | Stratification: Depth | Stratification: Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 1.3 | | | | | | Misc. Data: Lnth of hole 6.0'; Rock —; Wt of hammer —; Av fall of ham —; El of grd. water —; REMARKS |
| | 2.9 | | TOPSOIL. Tan, micaceous, clayey SILT w/minor red mottling and few rock fragments. | | | | Roots to 1.3'. Jar samples taken @ 1.5', 2.5' and 4.5'. |
| | 4.9 | | RESIDUUM. Red, micaceous, clayey SILT w/minor tan mottling and few rock fragments. | | | | Increase in rock fragments 3.0'-4.0'. |
| | 6.0 | | Tan to olive-tan, highly weathered GREENSTONE. | | | | Greenstone essentially a sandy SILT. Includes iron and manganese stains along joints. |
| | | | BOTTOM OF PIT. Completed 4:56 P.M. 24 Feb. 1976 | | | | Rock is foliated. Harder @ 5.0'. |

Location MINK CREEK SCOTTSVILLE, VA.

Contractor CRITTER

# BORING LOG

Structure BORROW PIT
Geologist S.G.W.
Engineer ——

Comm. No. 1176
Sheet 1 of 1
Boring No. TP-13
Date 25 FEB. 1976

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | | | | | | | Lnth of hole 3.0' |
| | | | | | | | Rock —— |
| | | | | | | | Wt of hammer —— |
| | | | | | | | Av fall of ham —— |
| | | | | | | | El of grd. water —— |
| | | | TOPSOIL. | | | | Roots to ± 1.0' |
| | 2.0 | | Tan, micaceous, clayey SILT w/ few | | | | |
| | | | rock fragments. | | | | Jar sample taken @ 3.5'. |
| | | | RESIDUUM. | | | | |
| | 4.2 | | Reddish-tan, micaceous, sandy | | | | Harder @ 4.2'. Greenstone |
| | | | clayey SILT w/ few rock fragments. | | | | is essentially a sandy |
| | | | Reddish-tan, decomposed | | | | SILT. Includes iron and |
| | 8.0 | | GREENSTONE. | | | | manganese stains along |
| | | | | | | | joints. |
| | | | BOTTOM OF PIT. | | | | Bag Sample no. 5 taken |
| | | | Completed 8:35 A.M. | | | | @ ± 6.0'. |
| | | | 25 Feb. 1976 | | | | The decomposed rock |
| | | | | | | | breaks down quickly. |
| | | | | | | | Weathered uniformly |
| | | | | | | | 2.5'-8.0'. |
| | | | | | | | Foliation dips to southeast. |
| | | | | | | | |
| | | | | | | | Located ± 100' south of |
| | | | | | | | east end of prominent |
| | | | | | | | east-west trending |
| | | | | | | | ravine. |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | | | | | |
| | | | VII-79 | | | | |
| | | | | | | | |

Location MINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure BORROW PIT | Sheet 1 of 1

Geologist S.G.W. | Boring No. TP-14

Contractor CRITZER | Engineer — | Date 25 FEB. 1976

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 1.3 | | | | | | Misc. Data: Lnth of hole 8.0'; Rock —; Wt of hammer —; Av fall of ham —; El of grd. water —; REMARKS |
| | | | TOPSOIL. | | | | Roots to 1.3'. |
| | | 1.~1 | Tan, micaceous, clayey SILT w/roots. | | | | |
| | | ~1~2 | Red, micaceous, clayey SILT w/ | | | | Jar samples taken @ 2.0', |
| | 4.0 | 2~4 | scattered rock fragments. | | | | 3.5' and 6.5'. |
| | | | RESIDUUM. | | | | Less weathered @ 4.0': |
| | | | Olive-green decomposed | | | | Rock fragments break |
| | | | GREENSTONE w/some red | | | | readily. |
| | 8.0 | | clayey partings. | | | | Greenstone is essentially |
| | | | | | | | @ sandy SILT. Includes |
| | | | BOTTOM OF PIT. | | | | iron and manganese |
| | | | Completed 9:05 A.M. 25 Feb. 1976 | | | | stains along joints. |

Location: LITTLE CREEK, SCOTTSVILLE, VA.

# BORING LOG

Structure: BORROW PIT
Geologist: S.G.W.
Engineer: ——

Comm. No. 1175
Sheet 1 of 1
Boring No. TP-15
Date 25 FEB. 1976

Contractor: CRITTER

| Stratification: Elevation | Stratification: Depth | Stratification: Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0 | | | | | | Lnth of hole 8.0' |
| | 1.2 | | TOPSOIL. Tan, micaceous, clayey SILT w/roots. | | | | Rock —— Wt of hammer —— Av fall of ham —— El of grd. water —— Roots as deep as 3.0' but generally ± 1.0'. |
| | 4.2 | | Red, micaceous, clayey SILT w/few rock fragments. | | | | Increase in rock fragments @ 3.5'. |
| | | | RESIDUUM. Red to green, decomposed | | | | Rock fragments blocky @ 4.0'. |
| | 5.2 | | GREENSTONE. | | | | Jar samples taken @ 3.0' and 5.0'. |
| | | | BOTTOM OF PIT. Completed 9:25 A.M. 25 Feb 1976 | | | | Greenstone essentially a sandy SILT. Includes iron and manganese stains along joints. Foliation dips to SE. |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure BORROW PIT | Sheet 1 of 1

Geologist S.G.W | Boring No. TP-16

Contractor CRITZER | Engineer — | Date 25 FEB. 1976

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 8.0' |
| | 0.3 | | | | | | Rock — |
| | 1.0 | | TOPSOIL. | | | | Wt of hammer — |
| | | | Tan to reddish-tan, micaceous, | | | | Av fall of ham — |
| | 3.0 | | clayey SILT. | | | | El of grd. water — |
| | | | Red to reddish-tan, micaceous, | | | | Roots to ± 1.0' |
| | | | clayey SILT w/few rock fragments. | | | | Rather fresh rock |
| | | | RESIDUUM. | | | | fragments @ 2.5'. |
| | 8.0 | | Red to green, highly weathered | | | | Jar samples taken @ |
| | | | to decomposed GREENSTONE. | | | | 2.0' and 6.0'. |
| | | | | | | | Below 4.0' material |
| | | | BOTTOM OF PIT. | | | | looks like Bag Sample |
| | | | Completed 9:50 A.M. | | | | no. 5. |
| | | | 25 Feb. 1976 | | | | Greenstone is essentially |
| | | | | | | | a sandy silt. Includes |
| | | | | | | | iron and manganese stains |
| | | | | | | | along joints. Rock fragments |
| | | | | | | | are blocky. |

Location MINK CREEK SCOTTSVILLE, VA.

**BORING LOG**

Structure BORROW PIT

Geologist S.G.W.

Engineer —

Contractor CRITTER

Comm. No. 1176

Sheet 1 of 1

Boring No. TP-17

Date 25 FEB. 1976

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 5.5' |
| | 0.0 | | | | | | Rock — |
| | 1.0 | | TOPSOIL. Tan, micaceous, clayey SILT w/roots. | | | | Wt of hammer — |
| | 3.0 | | Reddish-tan to red, micaceous, clayey SILT w/scattered rock fragments. | | | | Av fall of ham — |
| | 5.5 | | Red to green, highly weathered to decomposed GREENSTONE. | | | | El of grd. water — |
| | | | Less weathered 4.5'-5.5'. BOTTOM OF PIT. Completed 10:10 A.M. 25 Feb. 1976 | | | | REMARKS: Roots generally to ± 1.0'. Scattered quartz. Jar samples taken @ 3.0' and 5.0'. Greenstone is essentially a sandy SILT. Includes iron and manganese stains along joints. |

Location MINK CREEK SCOTTSVILLE, VA.

Contractor CRITZER

**BORING LOG**

Structure BORROW PIT
Geologist S.G.W.
Engineer —

Comm. No. 1176
Sheet 1 of 1
Boring No. TP-18
Date 25 FEB. 1976

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 7.3 | | | | | | Lnth of hole 7.0' |
| | | | | | | | Rock — |
| | | | | | | | Wt of hammer — |
| | | | | | | | Av fall of ham — |
| | | | | | | | El of grd. water — |
| | 1.0 | | TOPSOIL. | | | | Roots to ± 1.0' |
| | 2.0 | | Tan, micaceous, clayey SILT w/rocks. | | | | Blocky rock fragments |
| | | | Red, micaceous, clayey SILT w/rock fragments. | | | | @ 2.0'. Harder @ 4.0'. |
| | | | RESIDUUM. Olive to red, highly weathered to | | | | Material similar to Bag Sample no.5. |
| | 7.3 | | decomposed GREENSTONE. BOTTOM OF PIT. | | | | Jar samples taken @ 3.0' and 6.0'. |
| | | | Completed 10:30 A.M. 25 Feb. 1976 | | | | Greenstone is essentially a sandy SILT. Includes |
| | | | | | | | iron and manganese stains along joints. |

Location MINK CREEK SCOTTSVILLE, VA.

Contractor CRITZER

**BORING LOG**

Structure BORROW PIT
Geologist S.G.W.
Engineer ——

Comm. No. 1175
Sheet 1 of 1
Boring No. TP-19
Date 25 FEB. 1976

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 7.0' |
| | 3.7 | | | | | | Rock — |
| | | | | | | | Wt of hammer — |
| | | | | | | | Av fall of ham — |
| | | | | | | | El of grd. water — |
| | | | | | | | REMARKS |
| | 1.0 | | TOPSOIL. | | | | Roots to ± 1.0'; some as deep as 5.0' |
| | | | Tan, micaceous, clayey SILT w/roots. | | | | |
| | | | Red, micaceous, clayey SILT w/few decomposed rock fragments. | | | | Jar samples taken @ 3.0' and 6.5'. |
| | 4.5 | | RESIDUUM. | | | | Blocky @ 4.5' |
| | | | Red and green, decomposed | | | | |
| | | | GREENSTONE w/some clayey | | | | Harder @ 7.0' |
| | 7.0 | | partings. | | | | Greenstone is essentially |
| | | | BOTTOM OF PIT. | | | | a sandy SILT. Includes |
| | | | Completed 1:15 P.M. | | | | iron and manganese |
| | | | 25 Feb. 1976 | | | | stains along joints. |

Location MINK CREEK SCOTTSVILLE, VA.

BORING LOG

Structure BORROW PIT

Geologist S.G.W.

Engineer —

Comm. No. 1176

Sheet 1 of 1

Boring No. TP-29

Date 25 FEB. 1976

Contractor CRITTER

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 8.5' |
| | 0.0 | | | | | | Rock — |
| | | | TOPSOIL. | | | | Wt of hammer — |
| | 2.0 | | Tan, micaceous, clayey SILT w/ | | | | Av fall of ham — |
| | | | some roots. | | | | El of grd. water — |
| | | | Red to reddish-tan, micaceous, | | | | Roots to ± 1.0' |
| | | | clayey SILT w/ few rock fragments. | | | | Somewhat blocky @ 5.5' |
| | 5.5 | | RESIDUUM. | | | | Material below 6.0' is |
| | | | Red, tan to green, very highly | | | | like Bag Sample no. 5. |
| | | | weathered to decomposed | | | | Scattered quartz present |
| | 8.5 | | GREENSTONE. | | | | throughout trench. |
| | | | BOTTOM OF PIT. | | | | Jar samples taken @ 3.5', |
| | | | Completed 1:40 P.M. | | | | 6.0' and 8.0': |
| | | | 25 Feb. 1976 | | | | Greenstone is essentially |
| | | | | | | | a sandy SILT. Includes |
| | | | | | | | iron and manganese |
| | | | | | | | stains along joints. |
| | | | | | | | Pit @ head of east- |
| | | | | | | | west trending ravine. |

Location MINK CREEK SCOTTSVILLE, VA.

Contractor CRITZER

# BORING LOG

Structure BORROW PIT
Geologist S.G.W.
Engineer ——

Comm. No. 1176
Sheet 1 of 1
Boring No. TP-21
Date 25 FEB. 1976

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 8.5' |
| | | | | | | | Rock —— |
| | | | | | | | Wt of hammer —— |
| | | | | | | | Av fall of ham —— |
| | | | | | | | El of grd. water —— |
| | 0.0 | | | | | | REMARKS |
| | | | TOPSOIL. Tan, micaceous, clayey SILT w/roots. | | | | Roots to ± 1.0'. Material below 4.0' looks |
| | 2.2 | | Reddish-tan, micaceous, clayey | | | | like Bag Sample no.5. |
| | 3.5 | | SILT w/few rock fragments. | | | | Material is not blocky. |
| | | | RESIDUUM. Tan to reddish-tan, decomposed | | | | Very fissile and breaks up easily. |
| | | | sericite SCHIST or GREENSTONE. | | | | Jar samples taken @ 3.5' and 7.0'. |
| | 3.5 | | BOTTOM OF PIT. | | | | Shist or greenstone is essentially a sandy SILT. |
| | | | Completed 2:10 P.M. 25 Feb. 1976 | | | | Includes iron and manganese stains along joints. |

Location MINK CREEK SCOTTSVILLE, VA.

Contractor CRITZER

BORING LOG

Structure BORROW PIT

Geologist S.G.W.

Engineer —

Comm. No. 1176

Sheet 1 of 1

Boring No. TP-22

Date 25 FEB. 1976

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 8.0' |
| | 0.0 | | | | | | Rock — |
| | 1.0 | | TOPSOIL. | | | | Wt of hammer — |
| | | | Tan, micaceous, clayey SILT w/roots. | | | | Av fall of ham — |
| | 4.0 | | Red, micaceous, clayey SILT w/few rock fragments. | | | | El of grd. water — |
| | | | RESIDUUM. | | | | REMARKS |
| | | | Red to greenish-tan, highly | | | | Roots to ± 1.0' |
| | 9.0 | | weathered to decomposed sericite SCHIST or GREENSTONE. | | | | Rock fragments appear @ approx. 4.0'. |
| | | | | | | | Bag Sample No. 6 taken @ 6.0'; this bag sample is typical of residuum on high part of ridge. |
| | | | BOTTOM OF PIT. | | | | Blocky @ 6.0'. |
| | | | Completed 2:55 P.M. 25 Feb. 1976 | | | | Jar samples taken @ 3.0' and 6.0'. |
| | | | | | | | Residuum is essentially a sandy SILT. Includes iron and manganese stains along joints. |
| | | | | | | | Foliation dips to southeast. |

Location MINK CREEK SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure BORROW PIT | Sheet 1 of 1

Geologist S.G.W. | Boring No. TP-23

Contractor CRITTER | Engineer — | Date 25 FEB. 1976

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 6.0' |
| | | | | | | | Rock — |
| | | | | | | | Wt of hammer — |
| | | | | | | | Av fall of ham — |
| | | | | | | | El of grd. water — |
| | | | | | | | REMARKS |
| | 1.5 | | TOPSOIL. Tan, micaceous, clayey SILT w/roots. | | | | Roots to ± 1.0'. |
| | 3.0 | | RESIDUUM. Red, micaceous, sandy SILT w/some clay. Includes some tan mottling and blocky rock fragments. | | | | Jar samples taken @ 3.0' and 5.0'. |
| | 6.0 | | | | | | Hard @ 6.0'. |
| | | | Green, decomposed GREENSTONE. | | | | Greenstone is essentially a sandy SILT. Includes |
| | | | BOTTOM OF PIT. | | | | |
| | | | Completed 3:35 P.M. 25 Feb. 1976 | | | | iron and manganese stains along joints. |

Location MINK CREEK SCOTTSVILLE, VA.

BORING LOG

Structure BORROW PIT

Geologist S.G.W.

Engineer —

Contractor CRITZER

Comm. No. 1175

Sheet 1 of 1

Boring No. TP-24

Date 25 FEB. 1976

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 3.0' |
| | 0.3 | | | | | | Rock — |
| | 1.0 | | TOPSOIL. | | | | Wt of hammer — |
| | | | Tan, micaceous, clayey SILT w/roots. | | | | Av fall of ham — |
| | 4.0 | | Red, micaceous, clayey SILT. | | | | El of grd. water — |
| | | | RESIDUUM. | | | | REMARKS |
| | | | Red to tan, completely decomposed, | | | | Roots to ± 1.0' |
| | 5.0 | | sericite SCHIST to GREENSTONE. | | | | Blocky rock fragments @ 5.0' |
| | | | | | | | Jar samples taken @ 3.5' and 6.0' |
| | | | BOTTOM OF PIT. | | | | Harder @ 6.5' |
| | | | Completed 4:03 P.M. 25 Feb. 1976 | | | | Residuum is essentially a sandy SILT. Includes iron and manganese stains along joints. |

Location MINK CREEK SCOTTSVILLE, VA.

BORING LOG

Structure BORROW PIT
Geologist J.B.
Engineer —

Contractor —

Comm. No. 1175
Sheet 1 of 1
Boring No. P-1
Date 12 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 4.0' |
| | 0.7 | | | | | | Rock — |
| | | | TOPSOIL. | | | | Wt of hammer — |
| | 3.7 | | Reddish-tan CLAY. | | | | Av fall of ham — |
| | | | | | | | El of grd. water — |
| | 3.7 | | RESIDUUM. | | | | |
| | 4.7 | | Highly decomposed, white to light grayish-tan GREENSTONE. | | | | Slightly talcy. Jar sample taken @ 4.0'. |
| | | | BOTTOM OF PIT. | | | | |
| | | | Completed Afternoon of 12 Dec. 1975 | | | | |

Location: MINK CREEK, SCOTTSVILLE, VA.
Contractor: ——

BORING LOG

Structure: BORROW PIT
Geologist: J. G.
Engineer: ——

Comm. No. 1176
Sheet 1 of 1
Boring No. P-2
Date 12 DEC. 1975

| Stratification: Elevation | Stratification: Depth | Stratification: Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0 | | | | | | Lnth of hole 4.0' |
| | 1.0 | | TOPSOIL. | | | | Rock —<br>Wt of hammer —<br>Av fall of ham —<br>El of grd. water — |
| | 4.0 | | Red CLAY. | | | | Relict foliation dips approx. 40° southeast. |
| | | | BOTTOM OF PIT. Completed Afternoon of 12 Dec. 1975 | | | | Jar sample taken @ 4.0' |

Location MINK CREEK SCOTTSVILLE, VA.

BORING LOG

Structure BORROW PIT

Geologist J.B.

Engineer —

Contractor —

Comm. No. 1176

Sheet 1 of 1

Boring No. P-3

Date 12 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 4.0' |
| | 0.0 | | | | | | Rock — |
| | 0.7 | | TOPSOIL. | | | | Wt of hammer ---- |
| | 1.5 | | RESIDUUM. | | | | Av fall of ham — |
| | | | Red CLAY w/some quartz fragments. | | | | El of grd. water — |
| | 4.0 | | Highly to moderately decomposed, | | | | REMARKS |
| | | | slightly talcy GREENSTONE. | | | | Jar sample taken @ 4.0' |
| | | | Slightly decomposed, tan to red | | | | |
| | | | CLAY w/highly talcy, grayish-tan | | | | |
| | | | rock fragments. | | | | |
| | | | BOTTOM OF PIT. | | | | |
| | | | Completed Afternoon | | | | |
| | | | of 12 Dec. 1975 | | | | |

Location MINK CREEK SCOTTSVILLE, VA.

BORING LOG

Structure BORROW PIT

Geologist J. B.

Engineer —

Contractor —

Comm. No. 1176

Sheet 1 of 1

Boring No. P-4

Date 12 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 3.0' |
| | 0.0 | | | | | | Rock — |
| | | | | | | | Wt of hammer — |
| | | | | | | | Av fall of ham — |
| | | | | | | | El of grd. water — |
| | | | TOPSOIL. | | | | Clay includes very highly decomposed greenstone. |
| | 1.5 | | Tan-brown CLAY. | | | | |
| | | | | | | | Foliation dipping approx. 35° east. |
| | 3.0 | | RESIDUUM. | | | | |
| | | | Highly foley, slightly decomposed GREENSTONE. | | | | Bag sample taken @ 2.5'. Jar sample taken @ 2.8'. |
| | | | BOTTOM OF PIT. | | | | |
| | | | Completed Afternoon of 12 Dec. 1975 | | | | |

Location: RINK CREEK, SCOTTSVILLE, VA.
Contractor: ——

**BORING LOG**

Structure: BORROW PIT
Geologist: J.B.
Engineer: ——

Comm. No. 1176
Sheet 1 of 1
Boring No. P-5
Date 12 DEC. 1975

| Identification Elevation | Identification Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.0 | | | | | | Lnth of hole 4.0' |
| | 0.2 | | TOPSOIL. | | | | Rock —— |
| | | | Reddish CLAY. Moderately to highly rocky. | | | | Wt of hammer —— |
| | | | RESIDUUM. | | | | Av fall of ham —— |
| | 4.0 | | Tan, slightly talcy, highly to moderately decomposed GREENSTONE. | | | | El of grd. water —— |
| | | | BOTTOM OF PIT. | | | | Bag sample taken @ 2.5'. |
| | | | Completed Afternoon of 12 Dec. 1975 | | | | Jar sample taken @ 4.0'. |
| | | | | | | | Foliation dips 50° to the southeast. |

Location MINK CREEK, SCOTTSVILLE, VA. BORING LOG Structure BORROW PIT Comm. No. 1176
Sheet 1 of 1
Geologist J. O. Boring No. P-6
Contractor — Engineer — Date 12 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 3.5' |
| | 2.0 | | | | | | Rock — |
| | | | | | | | Wt of hammer — |
| | | | | | | | Av fall of ham — |
| | | | | | | | El of grd. water — |
| | | | | | | | REMARKS |
| | 0.1 | | TOPSOIL. | | | | Rocky zone @ 2.0' |
| | | | RESIDUUM. | | | | |
| | 3.5 | | Moderately decomposed, foley GREENSTONE. | | | | Closely jointed and 45° spalling below 2.0' |
| | | | | | | | Harder and slightly decomposed below 3.5' |
| | | | BOTTOM OF PIT. | | | | |
| | | | Completed Afternoon of 12 Dec. 1975 | | | | Jar sample taken @ 3.5' |

Location: MINK CREEK, SCOTTSVILLE, VA.
Contractor: —

**BORING LOG**
Structure: BORROW PIT
Geologist: J.B.
Engineer: —

Comm. No. 1173
Sheet 1 of 1
Boring No. B-7
Date 12 DEC. 1975

| Stratification: Identification | Stratification: Depth | Stratification: Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Sampler or Spoon: Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.7 | | TOPSOIL. | | | | Lnth of hole 2.3' |
| | | | RESIDUUM. | | | | Rock — |
| | 2.3 | | Reddish-tan, slightly taley, moderately decomposed | | | | Wt of hammer — |
| | | | GREENSTONE. | | | | Av fall of ham — |
| | | | BOTTOM OF PIT. | | | | El of grd. water — |
| | | | Completed Afternoon of 12 Dec. 1975 | | | | Slightly decomposed, light silvery gray-tan @ 2.3' Jar sample taken. |

Location MINK CREEK, SCOTTSVILLE, VA. | BORING LOG | Comm. No. 1176

Structure BORROW PIT | Sheet 1 of 1

Geologist J.S. | Boring No. B-3

Contractor —— | Engineer —— | Date 12 DEC. 1975

| Stratification: Elevation | Depth | Legend | Description of Materials (Type, color & Consistency) | Sampler or Spoon: Blows | Penetration | Sample No. | Misc. Data / REMARKS |
|---|---|---|---|---|---|---|---|
| | 0.5 | | TOPSOIL. | | | | Lnth of hole 3.5' |
| | | | RESIDUUM. | | | | Rock — |
| | 3.0 | | Reddish-tan, slightly to highly decomposed GREENSTONE. | | | | Wt of hammer — |
| | | | | | | | Av fall of ham — |
| | | | BOTTOM OF PIT. | | | | El of grd. water — |
| | | | Completed Afternoon of 12 Dec. 1975 | | | | moderately to highly foliated. Slightly decomposed below 3.0'. Jar sample taken. |

Location MINK CREEK SCOTTSVILLE, VA. BORING LOG Comm. No. 1176

Contractor ——— Structure BORROW PIT Sheet 1 of 1

Geologist J.C. Boring No. P-9

Engineer —— Date 12 DEC. 1975

| Stratification | | | Description of Materials (Type, color & Consistency) | Sampler or Spoon | | Sample No. | Misc. Data |
|---|---|---|---|---|---|---|---|
| Elevation | Depth | Legend | | Blows | Penetration | | Lnth of hole 1.5' |
| | 0.0 | | | | | | Rock — |
| | 0.3 | | TOPSOIL. | | | | Wt of hammer — |
| | 1.5 | | RESIDUUM. | | | | Av fall of ham — |
| | | | Moderately decomposed GREENSTONE. | | | | El of grd. water — |
| | | | | | | | REMARKS |
| | | | | | | | Residuum includes moderate amount of quartz fragments. Very slightly decomposed below 1.0' with bands and stringers of quartz. |
| | | | BOTTOM OF PIT. | | | | |
| | | | Completed Afternoon of 12 Dec. 1975 | | | | Jar sample taken @ 1.5'. |

# APPENDIX VIII

# REFERENCES

## REFERENCES


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